

MODEL Airplane NEWS



Aerobatic Artistry

**MASTER THE
ROLLING CIRCLE**

p. 70



Cermak
SUKHOI

FIRST LOOK!

**FEROCIOUS
FUJI 64**

Big gas power



**INFINITE
OPTIONS**

Multiplex Evo

**The first Gee Bee
was a biplane?**

See page 76



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Hangar 9 Funtana S > 3D performer
VMAR Aero Subaru > .40-scale ARF
Dynaflite Bird of Time ARF > Classic sailplane



JUNE 2004



MODEL Airplane NEWS

JUNE 2004, VOLUME 132, NUMBER 6

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ON THE COVER: Cermark's Sukhoi 31 ARF is a high-quality aerobat that offers first-class performance; see Mike Stroup's complete flight test on page 38. (Photo by John Reid.) ON THIS PAGE: The World Models Giant Zero prepares to land at the San Diego Mid-Winter Electrics event. West Coast associate editor John Reid was on hand for all the action; read his roundup of "the Best in the West" on page 32. (Photo by John Reid.)



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EDITORIAL

BY DEBRA CLEGHORN

GEE BEE BIPE?

With their massive cowls, stubby wings and barrel-shape fuselages, Gee Bee racers are some of the most recognizable planes around. But have you ever seen a Gee Bee with two wings? The little-known Gee Bee Model-A biplane actually started the renowned Granville brothers in the aircraft-design business, but if you're searching your memory bank for an image, you aren't alone; only nine Gee Bee bipes were ever produced. Now, thanks to Gee Bee researcher and enthusiast Henry Haffke, you can build your own 1/6-scale Model-A and have fun stumping other aviation enthusiasts at the field. This IMAA-legal plane has a 60-inch wingspan and features basic, built-up construction. Why not make it your next project?



Champion aerobatics pilot and instructor Quique Somenzini is back this month to continue his "Flight Techniques" series, and this time, he tackles the rolling circle and rolling loop. Although these difficult maneuvers may take a lot of practice to perfect, your plane's control-surface setup may hold the key to success. See Quique's step-by-step formula on page 70.

When the San Diego Silent Electric Flyers held the first Mid-Winter Electrics event eight years ago, they never dreamed that it would grow into the premier electrics gathering on the West Coast. This fun-fly now attracts more than 100 pilots, nearly 1,000 spectators and dozens of vendors to view and share the state-of-the-art in battery-powered RC. This year, West Coast associate editor John Reid was on hand to capture the action from little high-performance aerobats to giant-scale warbirds. See the latest in electrics on page 32, and don't forget to mark next year's gathering on your calendar.



Speaking of electric power, this month, "Powerlines" columnist Greg Gimlick offers the inside scoop on multi-motor wiring. Take advantage of the reliability

and simplicity of electric motors, and use them in your next twin aircraft!

With the flying season revving up into full swing, you're probably wondering which innovative new planes are on the horizon. In this month's "Thinking Big," senior tech editor Gerry Yarrish gives you an early peek at what's new and exciting in the world of giant-scale, but what about the latest smaller planes and gear? You need only wait one issue for our annual "What's Hot for Summer" sneak preview of the newest aircraft, radio, power and gear releases. See you then!



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PRINTED IN THE USA

We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA; email man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

BACKYARD P-40

I was very pleased to see that you decided to feature a molded-foam backyard flyer on your May 2004 cover. Although they aren't as powerful as the usual glow-powered models that you feature in *Model Airplane News*, the new crop of all-foam warbirds has me enjoying the hobby more than I ever have before. I had always wanted an RC Warhawk, but I never quite got around to building one. I was pretty heavily into RC back in the mid-'70s and early '80s, but since I retired, I have had less money to spend on RC, and my eyes aren't what they used to be. I now have six electric backyard flyers and can't get enough of them—especially the scale warbirds like the P-40N Warhawk! Thanks for including all types of RC models in your magazine—something that some of the other publications don't do. Keep the foam fighters flying!

Edward O'Sullivan
Binghamton, NY

Edward, we agree; the all-foam Flying Styro P-40 from Hobby Lobby is a great-looking backyard flyer with impressive flight charac-



teristics. Although our sister publication Backyard Flyer specializes in smaller, electric models, we felt that the new Warhawk was just the thing to excite Model Airplane News readers as well. Because of their fly-anywhere, anytime, convenience, backyard flyers of all

types are enticing many RC retirees to the new world of miniature RC. The wide variety of warbirds available is just icing on the cake! Welcome back!

GY

DELAWARE WARBIRDS

Even though I am a subscriber, I have never written to your magazine before, but the November 2003 issue of *Model Airplane News* inspired me. First, I read the "Warbirds over Delaware" article by Gerry Yarrish. The pictures are very good and so is the article text. I am very much affected by warbirds and have WW I and WW II models. Anyhow, after reading the article and seeing the great pictures—I wanna go!

Is it possible to get information about Larry Alles' Corsair? I have documentation on that specific aircraft. It was a Goodyear-built FG-1D used by the Salvadorian Air Force and was on the cover of the April 1976 issue of *AIR Classics*. The aircraft was restored by John Stokes and refinished in the markings of VF-84 from the USS Bunker Hill in 1944.

I also loved Roy Vaillancourt's "How To" article on using latex paint. A couple of fliers in our area have used latex, and



Xtreme

Pilots



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the computer-aided color-mixing capability is an added bonus. All in all, an excellent issue.

Larry Wilson [email]



Larry, thanks for the vote of confidence; we do enjoy covering warbird events and related topics. I do not have any additional information on Larry Alles' giant-scale Corsair, but you could contact the good folks of the host club for the Delaware Warbirds event. The Delaware RC Club has a great website that includes event photos and contact information for the club. Go to delawarerc.org, and tell 'em Model Airplane News sent ya! GY

CHUTE AND SHOOT WITH THE AEROBIRD XTREME

We at HobbyZone were pleased with the mention of our new Aerobird Xtreme [shown below] in "Air Scoop" of your May 2004 issue, but you incorrectly stated that the addition of the X-Port allows you to take photos. Our X-Port modules don't go quite that far, but they do allow flyers to drop parachutes and engage other X-Port-equipped aircraft in combat, which is great fun! If anyone would like to know more about the Aerobird Xtreme's features, we invite them to check out www.hobbyzonesports.com.

Steve Goodreau
Horizon Hobby Inc.



KNOW YOUR CG

Thanks for the article in the April 2004 issue (page 88) on how to balance a model, but I still need to know how to balance a biplane. Could you please provide me with this information?

Jack P. Shafer
[email]

Jack, in the April 2002 issue, my "Thinking Big" column "Biplanes—a closer look"

Smoothie.



The Simple Flex-Mount.

When it comes to reducing noise and vibration, it doesn't get any simpler than this.

Flex Mounts are easy to install -- no drilling or tapping. They are light weight (the .50 to .80 size weighs only 39 grams/1.38 oz complete). They help protect your airframe and electronics by absorbing harmful vibration. And they help reduce noise.

The kit includes a 6061-T6 Aluminum Backplate, Rubber Isolators and hardware. They are available in .35-.50 (S275), .50-.80 (S278) and .80-1.20 (S281) engine sizes, and replacement parts are available.

So be smooth. Use a Flex-Mount.

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One North Haven Street, Baltimore,
Maryland 21224 USA.
www.sullivanproducts.com

Sullivan

includes a couple of illustrations that show an easy way to determine the balance point for biplanes. In a nutshell, with a positive-stagger, straight-wing biplane, measure from the leading edge of the forward wing to the trailing edge of the aft wing. This adds the horizontal stagger distance to the forward wing's chord. Use this total distance as the mean aerodynamic chord, and then determine your 25- to 30-percent CG range. With a biplane with a sweptback top (forward) wing and a

straight lower (aft) wing, simply refer to the model's top view, add the stagger distances to the root and the tip chords, and treat the layout as if it was a tapered wing panel. Works every time!

Several readers have written to say how easy and accurate this method is. It even works for triplanes! By the way, you can purchase back issues of Model Airplane News by calling (800) 827-0323, or go to RCStore.com. GY

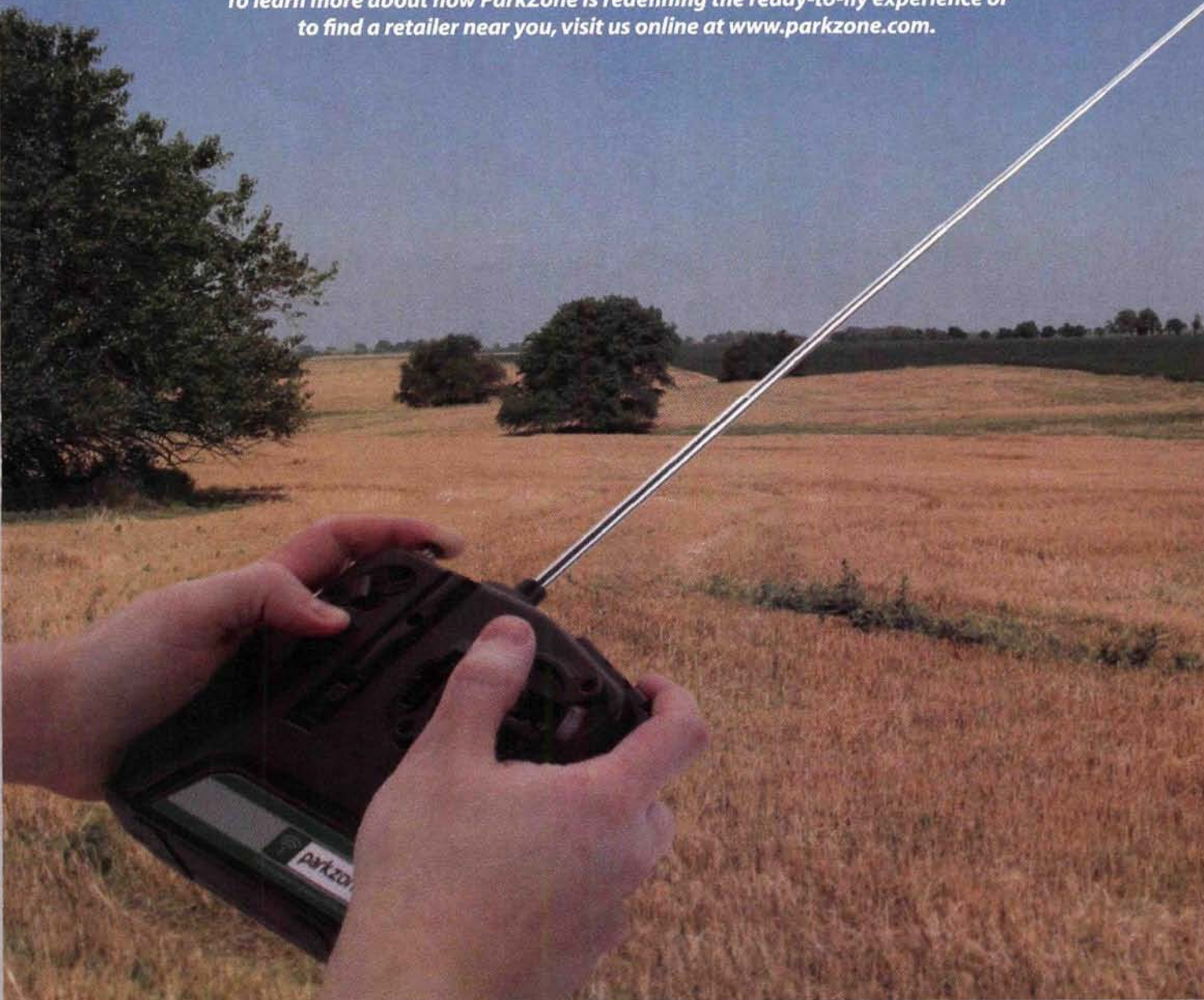
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From the people who pioneered no-experience-necessary RC flight comes ParkZone: a revolution in ready-to-fly freedom that combines innovative RC technology, like plug-n-play accessories and multiple flight modes, with hobby-quality park flyer aircraft.

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To learn more about how ParkZone is redefining the ready-to-fly experience or to find a retailer near you, visit us online at www.parkzone.com.



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J-3 Cub (PKZ1100)

Wingspan: 37 in (946mm)

Motor: 370 Power w/gearbox

FM Radio: 3 proportional channels

Mode Change Flight Control



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27 Stryker (PKZ1200)
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Motor: 480 Power direct drive
Radio: 3 proportional channels
Port enabled w/Mode Change Flight Control



Slo-V (PKZ1300)
Wingspan: 46 in (1166mm)
Motor: 370 Power w/gearbox
FM Radio: 3 proportional channels
X-Port enabled w/Mode Change Flight Control

AIR SCOOP

by the Model Airplane News crew

NEW PRODUCTS hit the model airplane market all the time, so here's the inside source for what's hot and where you can get it. For every issue, we sift through product announcements, show reports, rumors and prototypes to let you in on the best and the latest. Remember, you saw it here first!



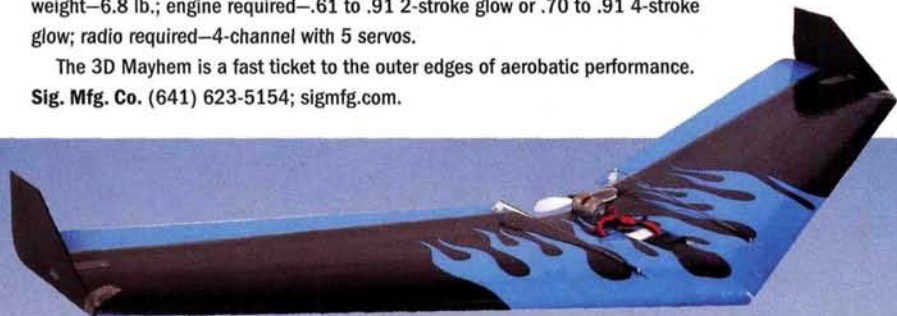
SIG MFG.

3D Mayhem ARF

During the past few years, aerobatics has taken on a new dimension: 3D flying has become popular, and more airplanes than ever are dancing in the air. Now you, too, can fly these wild maneuvers with the 3D Mayhem ARF from Sig Mfg.

This is not just an average aerobatic flyer; it has a generous wing area, a light construction and outrageously huge control surfaces with gargantuan throws—the only limits will be your piloting skills. The 3D Mayhem is ruggedly built of balsa and plywood, and it comes covered in red, white and blue Oracover polyester film. With a price of under \$300, it comes complete with a hardware package, a pull-pull rudder assembly, twin aileron-servo mounts, a short-coupled elevator mount, duraluminum landing gear, a scale tailwheel assembly, matching painted fiberglass cowl and wheel pants and fully illustrated assembly manual. Specs: span—72.159 in.; wing area—1,166.9 sq. in.; length—59 in.; weight—6.8 lb.; engine required—.61 to .91 2-stroke glow or .70 to .91 4-stroke glow; radio required—4-channel with 5 servos.

The 3D Mayhem is a fast ticket to the outer edges of aerobatic performance.
Sig. Mfg. Co. (641) 623-5154; sigmfg.com.



COMBAT WINGS

XE2 ELECTRIC-POWERED WING

Flying wings have a devoted following—no wonder, since they're perfectly suited to producing maximum performance using relatively small electric power systems. Take, for example, this 48-inch from Combat Wings; it is capable of 50mph and 15-minute flights with its stock Speed 400 motor and 8, 1500mAh cells. Its CNC-cut foam wing-cores were designed for maximum efficiency and to eliminate tip-stalling. The motor is recessed into the wing; this eliminates the need for a drag-inducing plastic fairing and allows more efficient cooling. The battery compartment is molded in; this further reduces drag and weight. A carbon-fiber spar reinforces the wing, and a stainless-steel motor mount holds the power system. Its flying weight is 24 to 27 ounces; this yields a wing loading of around 7 ounces per square foot—excellent for a high-performance plane and evidence that it will fly slowly as well as fast.

Combat Wings (714) 969-1686; combatwings.com.



FUTABA

CDR-5000 BATTERY CHARGER & THERMO STAND



We all know we're supposed to carefully monitor and maintain our batteries for optimum performance, and many chargers

have the features to do that. The problem is that most people just don't have the patience to meticulously access their charger's functions. The Futaba CDR-5000 can help. It has all the bells and whistles you'd expect, and it delivers them to you virtually hands-free, thanks to its giant, easy-to-read, backlit LCD screen. This display presents all the information you need at a glance—no scrolling to find the info or feature you need. It charges, discharges and cycles 1 to 8 transmitter or receiver cells (you don't have to remove them from the radio) and 1 to 36 motor cells simultaneously; it has reverse-polarity and overload-protection built in. It can produce full graphs of battery cycling and condition on your PC. It can be programmed for peak, set capacity, or temperature cutoff; the last of these uses the optional Thermo Stand. More than a simple heat sensor, the Thermo Stand monitors the temperature of each cell in a pack and allows precise cell management; this lets you know whether your cells are truly matched. Expect prices of around \$470 for the CDR-5000 and about \$40 for the Thermo Stand.

Futaba Corp. of America; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; futaba-rc.com.

BOVINE AERO-WORKS CESSNA CARAVAN 38 EP

Spanning 38 inches, the Cessna Caravan is cut out of 1.2-pound-density EPS white foam and uses carbon-fiber rods and contest-grade balsa and plywood for strength. The model can use a variety of power setups. Our prototype used the 300C 5.33 motor and a 9x7x3 prop. The kit comes with a 1/16-inch-thick aluminum main gear, a steerable nose-wheel and 6mm Depron tail sections. The cargo pod allows easy battery access without your having to remove the wing. It can be painted or finished with light, low-temp film covering. Specs: wingspan—38 in., length—29 in., wing area—219 in.; flying weight—13 oz.

Bovine Aero-Works; bovineaeroworks.com.



EVO-FLIGHT

SHOGUN 400

The first in a new line from Global Hobby, this outstanding high-performance micro helicopter has impressive features that rival those of much larger machines.

Test pilot Paul Anderson (in photo) says that the years of development and refinement that went into creating this helicopter were well worth it. This collective-pitch machine features a molded-nylon and fiberglass-



composite main frame, an aluminum-pipe tail boom, a ball-bearing-supported, carbon-shaft tail drive and drive gear (with autorotation). Specs: length—630mm; main-rotor diameter—635mm; tail-rotor diameter—130mm; motor—Speed 400; weight—approximately 530g. With the recommended 2-cell, 1400mAh Li-poly battery, the Shogun 400 boasts flight times of 10 to 12 minutes.

EVO-Flight; distributed by Global Hobby Distributors (800) 854-8471; (714) 963-0133; globalhobby.net.



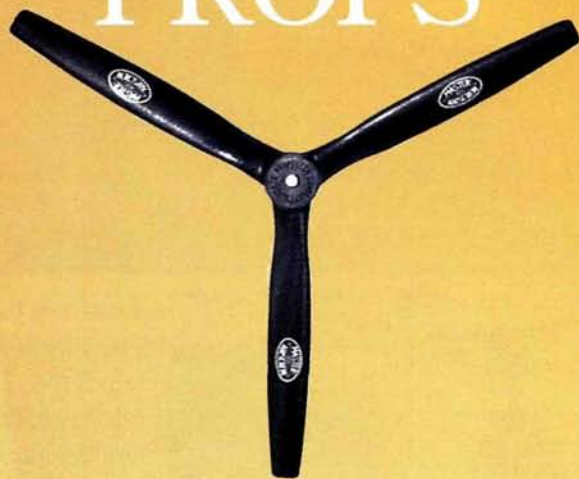
CARL GOLDBERG PRODUCTS

SUPER FLOATS KIT

Do you have a .40-size model that cries out to be a floatplane, but all the floats out there are either too small or too clunky for your pride and joy? Carl Goldberg Products has just the thing: these floats are all balsa and plywood, are simple to build and can easily support any 6.5- to 9-pound model. They are self-aligning and come with a single rudder for shallow-water taxiing. The kit comes with all the necessary hardware and should sell for about \$54; the floats would be a perfect match for a .40-size Piper Cub. **Carl Goldberg Products Ltd.** (678) 450-0085; carlgoldbergproducts.com.

MASTER AIRSCREW

3-BLADE PROPS



Master Airscrew now offers new propellers in its popular 3-blade series: 6x4, 7x4 and a 9x7 pusher. Three-blade propellers offer a solution to ground-clearance problems and add a scale touch. The 6x4 and 7x4 blades are nicely suited to .10 to .25 glow engines and sport electrics. The 9x7 pusher pairs up nicely with the existing 9x7 3-blade tractor propeller for .40 2-strokes. Prices range from \$3.95 to \$6.95.

Master Airscrew; distributed by Windsor Propeller Co. Inc. (916) 631-8385; windsorpropeller.com.



E-FLITE

TRIBUTE 3D & ULTIMATE 3D

These two light foam planes from E-flite are a snap to assemble and offer extreme 3D performance indoors and out! Torque rolls, elevators, harriers, rolling circles; if you have the thumbs, these flyers will deliver. Because they're so durable, they're ideal aerobatic trainers, too. Each comes with a 370 motor, a gearbox and a propeller that were designed specifically for it. Just assemble the foam parts, install your 4-channel radio system, and you'll be at the field in a few hours.

Ultimate specs: wingspan—28 in.; length—29.5 in.; wing area—436.6 sq. in.; weight—9 oz. Tribute specs: wingspan—37 in.; length—27.5 in.; wing area—374.6 sq. in.; weight—9 oz. Both planes come with a detailed 3D flying and setup guide.

E-flite; distributed by Horizon Hobby Distributors; (800) 338-4639; horizonhobby.com.



EXPERIMENTAL AIRCRAFT MODELS

1/5-SCALE GLASTAR

Experimental Aircraft Models (EAM) has just finished test flights of its impressive 84-inch-span Glastar. This almost ready-to-fly (ARF) Glastar is a scale replica that accurately captures the graceful compound curves of the full-size homebuilt aircraft. The kit includes a fiberglass fuselage, an engine cowl, wheel pants with fairings, sheeted-foam wings (with flaps) and tail feathers covered with Oracover. It comes in conventional (tail-dragger—TD) and tricycle landing gear versions for your choice of construction. If you're looking for a sleek, out-of-the-ordinary scale flyer, the Glastar, at less than \$350, is just the ticket for relaxed sport or scale competition flying. Designed to use a .60 to .91 2-stroke or an equivalent 4-stroke engine, the model weighs 8 pounds and has a nice 25 ounce-per-square-foot wing loading.

Other 1/5-scale EAM kits include a 60-inch Glasair Super II FT and TD, a 60-inch RV-6, a 60-inch Zodiac XL, a 74-inch Challenger II, a 60-inch Europa XS and an 80-inch Velocity XL canard.

Experimental Aircraft Models (248) 473-7232; RCHomebuilts.com.



AIRBORNE MEDIA

Skyraider Fine Art Poster

Does your workshop look a little dull? Do you need to spruce it up a bit? Why not hang up a great-looking poster of Nick Ziroli Sr.'s award-winning Skyraider? This photo is available in 20x16 and 36x24-inch sizes and is printed on heavy, high-quality glossy paper with archival-quality inks. All posters are shipped in tubes for a wrinkle-free display. Prices: \$14.94 for 20x16-inch size; \$19.95 for the 36x24-inch version (plus \$5 S&H).

Airborne Media (888) 829-4060; airbornemedia.com.

WILDMANN GRAFFIX

Custom Vinyl

Wildmann Graffix offers finely detailed vinyl products that are tailored especially for the aviation lover. Intended for use on your model trailer, shop window and automobile, these custom-cut aircraft graphics are easy to apply and are available in several sizes, aircraft types and colors (red, yellow, white, black and blue). The graphics come completely cut and ready to apply to any clean, dry surface. Peel away the backing, position it, squeegee down and smooth it out; then remove the transfer layer. The vinyl material is flexible and will go over seams, rivets and screw heads. Choose from a wide selection of classic and military aircraft. Sizes range from 12 to 30 inches. Prices start at \$15.95, and the larger designs are \$34.95 (plus S&H). Custom work is also available.

Wildmann Graffix (631) 721-5807; wildmann71@hotmail.com; hangtimes.com. ✈



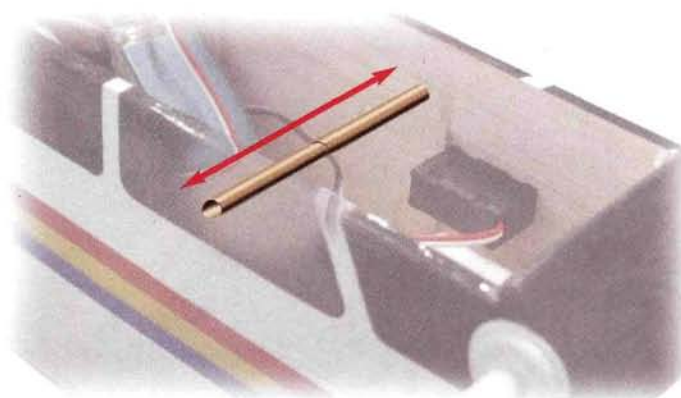
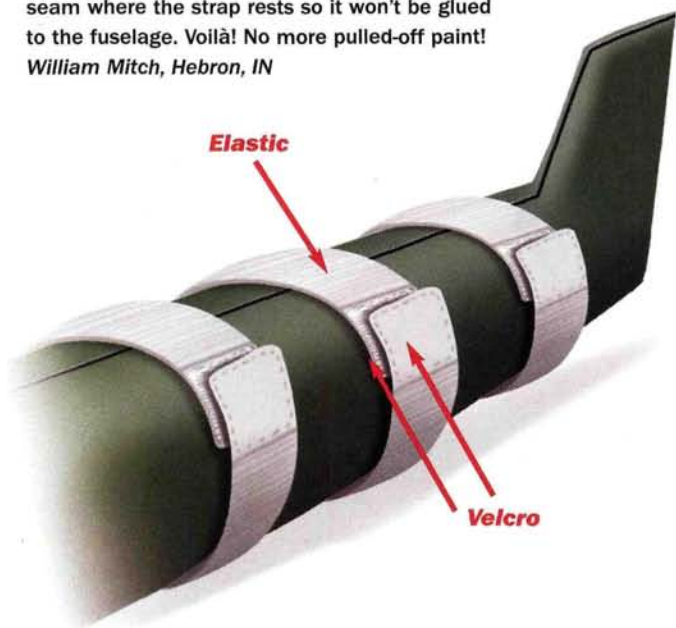
SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or a one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE THAT YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can neither acknowledge each one nor return unused material.

all wrapped up

Prepainted foam ARF park flyers are very popular these days because they are quick and easy to build. A lot of them have molded fuselage halves that must be firmly held together while the glue dries, and most modelers use tape for that. Unfortunately, though, when you remove the tape you may also remove some of the paint. Here's a simple solution.

Head over to your local fabric shop and purchase elastic strips and Velcro. Cut the elastic to various lengths, and sew or staple a square of Velcro on each end; the straps are now ready for use. The next time you glue a fuselage together, tightly wrap several of these elastic straps around it. If needed, place a piece of wax paper over the seam where the strap rests so it won't be glued to the fuselage. Voilà! No more pulled-off paint!

William Mitch, Hebron, IN



measuring up

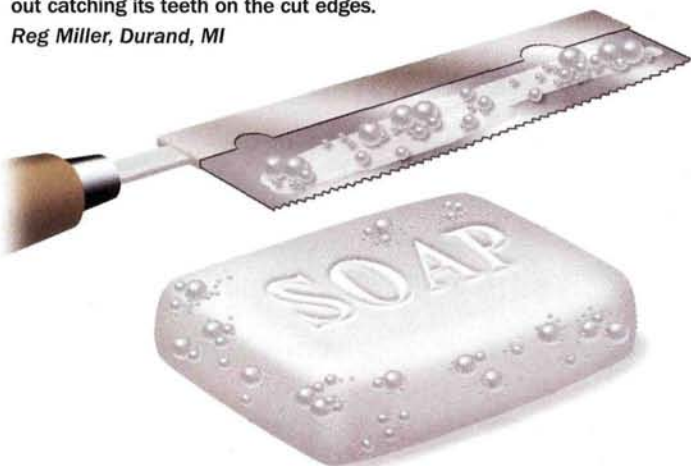
Do you ever find it difficult to take inside measurements from confined areas such as the inside of a fuselage or between wing ribs? You can make a simple measuring gauge using two pieces of telescoping brass tube. Cut suitable lengths of $\frac{1}{4}$ -inch-o.d. and $\frac{9}{32}$ -inch-o.d. tubes, and insert the smaller tube inside the larger one and then collapse the mechanism. Place the gauge in the area to be measured, and pull the tubes apart until they touch both sides, mark and withdraw the gauge and measure its length, and you'll have the inside measurement you need.

Don Orndorf, Millersburg, PA

smooth operator

Razor saws are handy for cutting various materials, but their teeth sometimes "snag" the material, especially during long cuts on hardwood. Here's an old woodworkers' trick that works equally well for modeling. Rub a slightly damp bar of soap on both sides of the saw blade. The soap acts as a lubricant and helps the razor saw cut smoothly without catching its teeth on the cut edges.

Reg Miller, Durand, MI



open and say ahhh

All RC models have clevises that attach the pushrods to the control surfaces. Some clevises, especially metal ones, are difficult to spread apart; many a fingernail has been broken trying to do so. This easy-to-make tool falls in the "Why didn't I think of that?" category. On a piece of $\frac{3}{16}$ -inch-diameter brass tube that's $2\frac{1}{2}$ inches long, flatten one end to form a smooth taper. To make a handle, drill a $\frac{3}{16}$ -inch-diameter hole $\frac{1}{2}$ inch deep into a piece of wood, then glue the round end of the tube into the hole in the wood. To ensure a more secure hold, insert a pin through the tube and the wood handle. Slide the tapered end of the tool through the clevis near the pin—presto! The clevis will open effortlessly. †

Fred Mulholland, Tampa, FL

SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable, but please do not send digital printouts or Polaroid prints. Emailed submissions must be at least 300dpi. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of \$500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Mantua Models Tigrotto

Walter Gremlitz

Sun City Ctr., FL

Here's a kit you don't see every day. The Tigrotto can be built in one of three configurations. Walter chose the pusher-prop layout, powered by an O.S. .10 engine (mounted inverted) and a 7x4 prop. Despite its small displacement power, this 46-inch-span model's fuselage frame is made mostly of metal—aluminum square tubing—and has a plastic fuselage cover. The wing is wood-sheeted foam. Walter customized it to include ailerons and converted it from a tail-dragger to trike gear and gave it a steerable nosewheel. The paint is Krylon, applied in Walter's own design. Nice job; we bet that this one definitely catches eyes at the field.



Albatros D-III

Herman Burton

Seabrook, TX

Starting with a Fred Reese Vintage biplane, Herman decided to bash his biplane kit into the spitting image of Gerhard Bassenge's 1917 Albatros D-III.

Using photos and illustrations from "Albatros Aces of World War I" for a guide, he added Williams Bros. scale machine guns and wheels, redesigned the cockpit with simulated leather padding, a foot recess and a full instrument panel from J'Tec, and added full flying wires from Sullivan and a tailskid with a functional bungee. Herman chose Painter's Choice latex paint from Home Depot because it's inexpensive; then he fuelproofed the Albatros with Nelson Hobby Specialties polyurethane. Herman reports that no decals were used on his model; he made the iron crosses on the computer, printed them on "Frisket" adhesive-backed film and painted them in place. All other markings were masked and painted. For power, Herman installed a SuperTigre .40, controlled by Futaba gear.



Messerschmitt Me 109 E-3

Juan Gerardo Narvaez Tijerina

Monterrey, Nuevo Leon, Mexico

We're suckers for a scratch-built scale warbird, especially if it has the detail of Juan's Me 109. This is the second version; its predecessor was of balsa and ply, but the one you see here has a fiberglass fuselage and spinner that Juan crafted using molds he designed. The wings and tail remain balsa and ply covered in fabric and painted in automotive colors. Weathering was added using artists' oil paints. The whole thing was then fuelproofed with polyurethane varnish. The fighter is powered by a SuperTigre .45. The full-size Me 109 was a topnotch performer, and Juan reports that his model has the same flying characteristics.



Nieuport Type VI

Mike Hawkins, Bangkok, Thailand

This pilot's project came halfway around the world to reach the *Model Airplane News* offices, and we're sure glad it did. Just look at the detail on Mike's 1/6-scale WW I wonder! The floats are functional, but because he built it for the WW I scale fly-in at Wright Field in Dayton, OH (long trip!), Mike embedded removable wheels for tarmac landings. He reports that because of the dicey yaw characteristics, the full-size plane was often flown without using the pedal-actuated wing-warping mechanism. To save weight while preserving scale handling, Mike omitted the wing warping on his Magnum 91 FS-powered model. He reports that it "steers like a drunken duck" on the rudder, but the plane looks no worse for that. Nice job, Mike.



Fokker D-VII

Donald Solomon

Ogden, UT

Inspired by a *Time/Life* "Epic of Flight" poster, Donald built this 1/4-scale Fokker from W.E. Technical Services plans and painted it to match the poster using Nelson Hobby paint. Underneath, the 87.5-inch-wingspan biplane is covered in Nelson Lite fabric, and it's dressed with Ken Jones graphics and 1/4-scale Spandau machine guns. The 20-pound plane packs a G-38 up front and is controlled by an Airtronics Vanguard 6-channel radio. The D-VII is a sweet flyer, and the unusual color scheme attracts plenty of notice at the field; it sure caught our eye!

Electric Hawker Tempest

Jean Tardif

Saint-Jean-sur-Richelieu, Quebec, Canada

Jean's clean rendition of the sleek Hawker Tempest Mk II is built from a Ron Daniels kit. A geared Astro 05 spins an 11x8.5 prop on 10, 3300 NiMH cells. The clean, quiet power doesn't disturb the Solartex covering or Jean's neighbors. The 45.1-inch-wingspan model weighs just 4 pounds ready to fly, so we expect that much of the full-size Hawker's legendary maneuverability carries through to this pretty example. Très magnifique, Jean!



Fokker Dr. 1
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Scratch-built Fiat CR 32

Gordon Solomon

Swarland, Morpeth, England

Here's a striking Italian biplane by way of England. Gordon sent photos of his scratch-built, 35-percent Fiat CR 32 powered by a Brison 2.4 swinging a 20x10 prop. The ignition on that big Brison caused some interference during initial testing, so Gordon relocated the radio aft and looped the servo leads through ferrite rings. The sharp finish is doped tissue covered by nylon and attached with wallpaper paste. Gordon reports he used both emulsion and Flair paints topped by polyurethane varnish. We think the effort was worth it, and we're thrilled that he shared photos of his beautiful biplane with us.

Top Flite P-40E Warhawk

Chris Pydee, Winnipeg, Manitoba, Canada

Chris reports that this beautiful P-40 took him 3 years and 8 months to complete; obviously, he believes in taking the time to do a job right. For power, the 22-pound model relies on an O.S. .91 Surpass II 4-stroke fitted with a custom exhaust and a muffler that's fully contained within the cowl to avoid unsightly holes. The P-40 also features a remote glow starter, a pressurized Sullivan fuel system and Robart retracts with RoboStruts. The model features flaps and functional drop tanks mixed to the full-flap setting. All radio gear is Hitec. The Top Flite MonoKote covering was airbrushed with Model Master camouflage colors for a truly authentic finish. Chris, we're glad that you found articles in *Model Airplane News* useful along the way. Congratulations on a beautiful model. ✈



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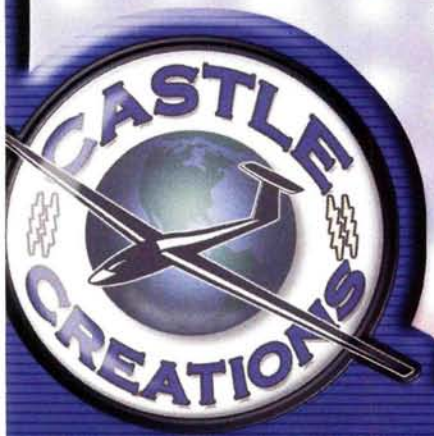
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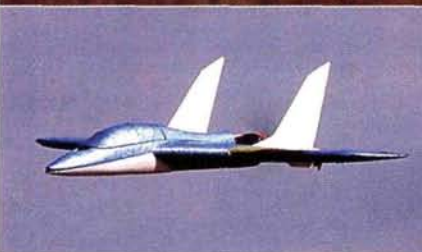
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Kyle Mashima hovers his Diablotin XL close to the runway as he enjoys all the power his plane gets from its Hacker motor powered by a Thunder Power battery pack 4s3p.



BY JOHN REID

SAN DIEGO MID-WINTER ELECTRICS

SoCal power-up!

Today's electric RC planes can range from tiny 3D flyers that flit and zoom like high-energy insects to gorgeous $\frac{1}{3}$ -scale warbirds that exemplify heavy-metal, electric power that has permeated every aspect of RC. Recognizing the awesome potential of battery power, the Silent Electric Flyers of San Diego eight years ago began to host the Mid-Winter Electrics every February. In that time, members have seen electric flight grow in leaps and bounds, while their own event has become the West Coast's premier electric get-together. Mid-Winter Electrics is a gathering of pilots, vendors and spectators who all share the latest in design, technology and performance for electric fliers. Though there are some contests for competition-minded fliers and noontime demos by manufacturers, most of the four days revolve around open flying, allowing pilots to show off their latest projects to fellow pilots without the fear of competition jitters.

PHOTOS BY JOHN REID



Power and performance to do it all



It seems as though every day, a new development occurs in the world of electric flight, and this is readily apparent each year at events such as the San Diego Mid-Winter Electrics. Today's power-performance improvements in brushless motors have pushed thrust levels well beyond the weight of even larger models. Batteries now weigh less and push more amps than those produced just a few years ago. All this adds up to pilots being able to fly some pretty large planes on electric power, and a number of large, high-performance planes were present at this event.

One example of this was the nicely done Hangar 9 Corsair (top photo) by Doug Cronkhite. This plane is pulled across the sky with authority by a Hacker C50-10L powered by Thunder Power Li-poly batteries wired 5s4p. This 65-inch-wingspan plane has retracts and weighs a total of 8 pounds.

Another scale beauty was The World Models Giant Zero (second photo from top) by Kyle Mashima. This large model is powered by a Hacker C50 14XL with an Aero geared 6.7:1 and able to swing a 24x12 prop. Kyle has three Thunder Power 8000 Li-poly packs 10s4p just behind the motor in the cowl.

Kody Knudtson was able to perform all kinds of 3D maneuvers with his AeroWorks 31-percent Edge 540 (center photo). Two Hacker C50s running an Inner Demon 32 gearbox power this giant-scale performer. The juice is supplied by two Thunder Power Li-poly 10s3p batteries, one to each motor.

Torque rolls are no problem, even at the end of the flight. Dave Sullivan and Terry Bratton flew identical Razzias (second photo from bottom) with 3D aerobatics during a long flight routine just because they could. Both planes run with a Hacker C50 14XL geared at 6.7:1 with spark provided by two Thunder Power Li-poly 8000 5s4p batteries.

How much power does one of these planes need? Ed Sweeney's 3W Xtra-Fun (bottom photo) with two 430-40-1700W High Torque installed end to end on one motor shaft. Two Thunder Power batteries wired up 10s4p have to produce 94.9 amps at 30.4 volts, packing a whopping 2,899 watts to two Aveox Sh-96 controllers. Wow!

As you can see, power and performance can now come from electrics, and they can match or exceed gas or glow power. Electrics have come a long way in the past couple of years and now are a real consideration for any kit out there.

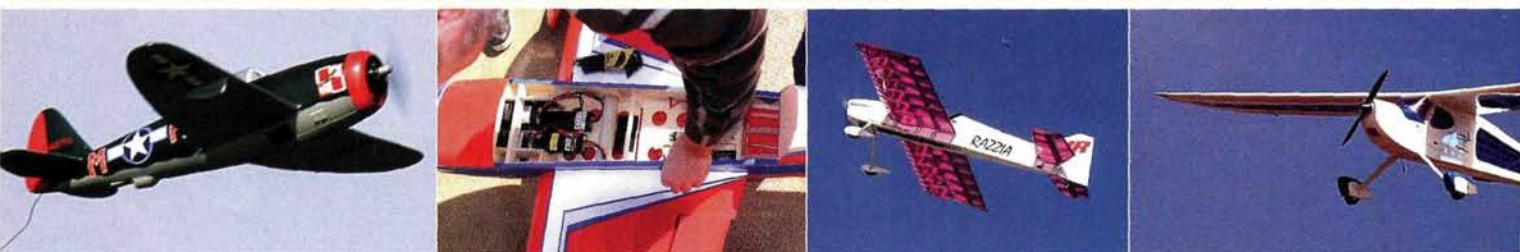
THE WHO'S WHO OF ELECTRIC FLIGHT

This year's event attracted 110 pilots from eight states and Canada. Attendees came from California, Washington, Oregon, Nevada, Colorado, Arizona and from as far away as New York and Pennsylvania, and one pilot was from Germany! Next to the pit area was a vendors' row, where 21 local suppliers of fine RC products showed and sold their latest merchandise. Some notables included Hitec, Hobby People, Dymond Modelsports, Thunder Power and Castle Creations, just to name a few. An estimated 900 to 1,000 spectators crowded in to admire the static display of planes in the pits and to purchase some much-needed RC products.

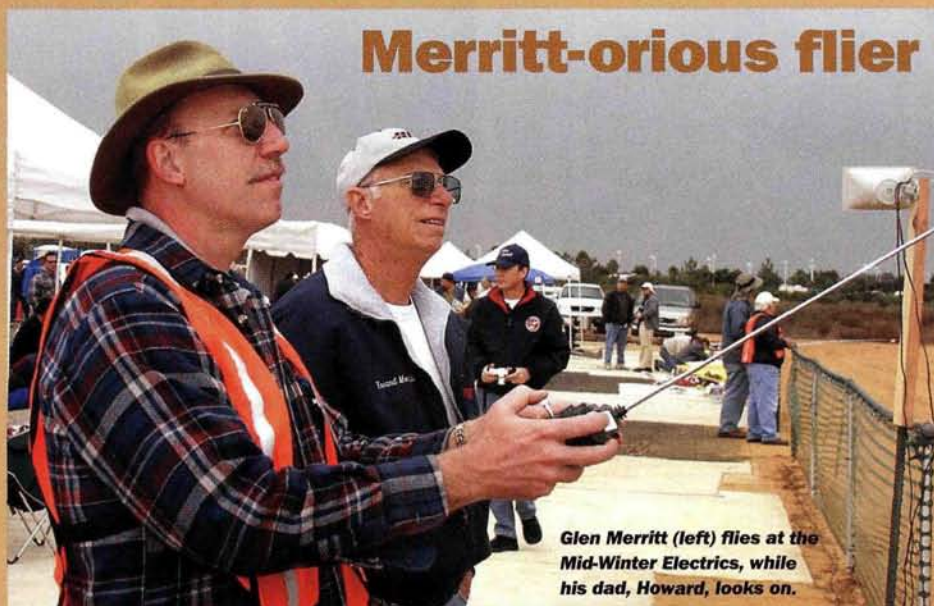
This year's emphasis was on open flying, and that's exactly what we got. Participants awaited their turns to fly in the teeming skies, where three to six planes flew at any given moment. The Silent Electric Flyers did a great job of regulating the frequencies to avoid any problems in the skies. When a pilot was ready to fly, he took his AMA card to the frequency-control tent, and if his frequency was in use, the card was put behind the one of the person flying. If the frequency was clear, he was given his transmitter and permission to fly. Each pilot was allowed 10 minutes of flying time; if it ran longer, a request to land came over the loudspeaker.

NOONTIME DEMOS

The windy weather didn't favor some of the planned events, but the daily noon-time demonstrations went on without a hitch. The demo pilots from the vendor booths had the necessary flying skills to successfully navigate in windy conditions. Many new products demonstrated how far electric-powered flight has come. Longer flight times combined with power-producing batteries and motors really made for an entertaining noon demonstration. One such demo came from Dymond Modelsports, when Helmut Goestl carried up a 2.8-meter (114-inch) Last Down XL glider piggyback on a Rearwind Speeder. The 100-inch Rearwind Speeder is powered by a



Glen Merritt is one of those familiar faces you always see at all the shows and events. He has been a fixture at the Mid-Winter Electrics for the last four years and really enjoys flying electric planes. He began flying U-control planes when he was 10 years old, which led to RC planes in 1982. RC aerobatic flying inspired him so much that he got his pilot's license to fly full-size planes, hoping to fly aerobatics in the future. Glen is happy to fly anything RC, whether it is an indoor airship at the San Diego Gulls' hockey game, a large gas-powered aerobatic plane, a screaming racer, a slope-soaring plane, or even a small electric trainer. Just hand him the transmitter, and he is all smiles. This year marks Glen's seventh year as marketing manager at Hitec RCD, and with the addition of the diverse Multiplex line of products, Glen will have plenty of items to market. Glen regularly plans flying trips with his son, who is already learning how to fly at the tender age of six. Of course, he trains on a Multiplex Easy Star!



Merritt-orious flier

Glen Merritt (left) flies at the Mid-Winter Electrics, while his dad, Howard, looks on.

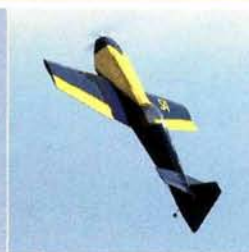
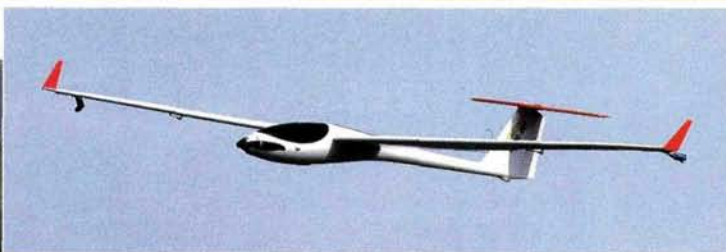
40-5 Actro motor and weighs 25 pounds with the glider attached. During the climb to altitude, a smoke system was activated that came from the wingtips of the glider and from under the fuselage of the Rearwind Speeder and continued after the planes separated.

EVERYBODY LIMBO

Sunday's weather was much better, and the flying line was always long. Everyone passed the time by waiting for the day's big events—the raffles and Dr. Jet's dreaded limbo combat. The raffles—with more than \$6,000 in prizes—took some time to complete. Tickets were distributed to pilots with their entries and to workers based on length of service, and they were sold to the general public. Needless to say, after the raffle, many people walked around with some newly acquired prizes.

During the raffle drawing, workers set up the limbo line across the field. At about six feet high, it didn't seem to pose that big a challenge. But then they attached large, three-prong fishing hooks that hung down two to three feet, and just to make it a little harder, 8x8x16-inch concrete blocks were randomly

Here is just a sampling of all the great-looking planes that lined the pit area. Spectators spent hours marveling at the tremendous variety of aircraft.





placed under the bar to make touch-and-go passes a little more challenging. Now the planes had only two to four feet clearance under the limbo line; OK, that might be a little more difficult to fly under. Contestants earned 1 point for each time their plane passed under the limbo bar; flying inverted under the bar earned 2 points.

This event is a little different each year and is always a crowd-pleaser because (author's opinion) of the carnage! This year, it was even more of a crowd-pleaser because the spectators were allowed to participate in creating a little destruction. There were buckets filled with about 200 tennis balls, and anyone who felt the need could throw these at the planes while they navigated the limbo bar in an effort to eliminate participants from the competition. Daniel Belknap, son of Steve Belknap of Diversified Model Aircraft, survived the tennis ball onslaught and won the Limbo Combat.

Both the pilots and the crowd had so much fun that after a short break to collect all the balls, they flew another round just for kicks! After the wreckage cleanup, it was back to open flying.

SEE YOU NEXT YEAR

This year's Mid-Winter Electrics, as in the past, was a great success, even though Mother Nature didn't completely cooperate. The open-flying format was a hit with all the pilots, and the well-organized radio impound gave ample flying time to everyone. The wide diversity of vendor booths offered the spectators more to do than just gawk at the assortment of planes in the pit area (there were many outstanding aircraft to admire). If you enjoy the world of electric RC flying, I recommend that you mark your calendar

now for the 2005 San Diego Mid-Winter Electrics. For more information, check out the Silent Electric Flyers' website at sefsd.org. ✈



Kyle Mashima changes out a set of batteries on his The World Models Giant Zero. It has three Thunder Power 8000 Li-poly packs 10s4p just behind the motor in the cowl.



This beautiful DC-3 has a 6-foot wingspan and is powered by two AstroFlight 05 motors geared 3:1.

sponsors

The San Diego Mid-Winter Electrics is such a great event in part because of the support from its corporate sponsors. The event would not be possible without backing from the business community, and for the Mid-Winter Electrics, these manufacturers really contributed to its success.

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**CERMARK***by Michael Stroup*

Sukhoi

SU-31

First-rate finish for an aerobatic ace

The full-size Sukhoi 31 is aggressive in both its looks and its flying characteristics, and these traits come through in Cermark's ARF version of this cutting-edge aerobat! It is sure to appeal to Sukhoi fans and to attract a few more modelers in your club, especially when they get a look at this beautiful ARF's excellent quality and workmanship. When offered the opportunity to review the Cermark Sukhoi 31, I couldn't refuse. Read on to see why it will be hard for you to resist this first-class performer as well.



GETTING STARTED

Unpack the Sukhoi, and you will discover a finished fuselage, two wing panels, tail surfaces, a canopy, a main gear strut, a painted engine cowl, decals and a hardware package with instructions. This plane is nearly complete before you start. Due to the high level of completion, a blow-by-blow recitation of the assembly isn't necessary here. The instructions provide adequate detail, and the wording is clear and easy to follow.

The instructions begin with a note that you may need to touch up the covering, which may have wrinkled during shipping. This is the best film job on an ARF I've seen to date. Pay particular attention to the seams and overlaps, and double-check all the areas you won't be able to access after you've installed the control surfaces. While you are touching up the

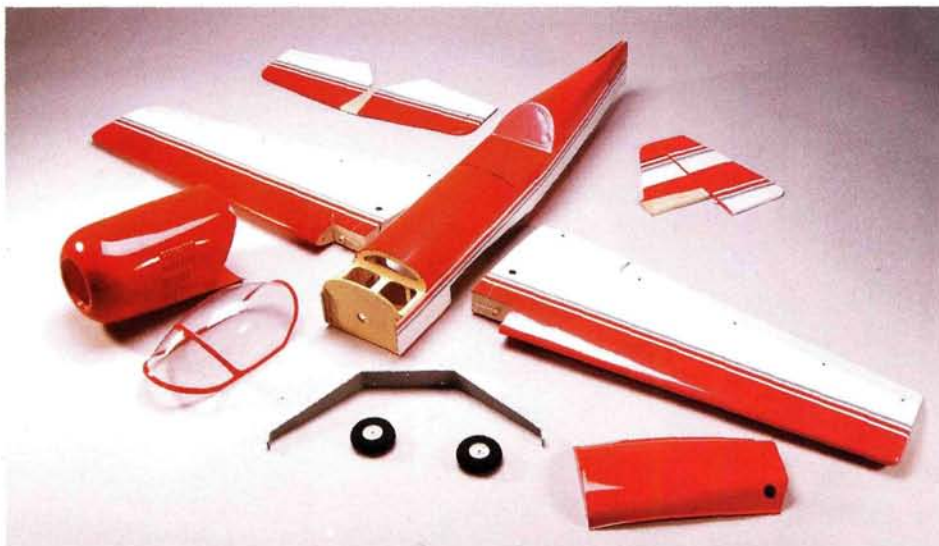
film, you might as well have an X-Acto knife ready to cut out the servo holes.

- **Wing.** Start by mounting the aileron servos on the hatches. After bonding the servo rails to the hatch, give them a good CA soaking to add a bit of splinter-resistance. The factory placed a tether in the wing to help you fish the servo wires through. Hinging the ailerons follows; the instructions would have you glue the supplied pin-type hinges into the wing panel first. This is awkward; bonding the hinges into the aileron first yields better results. After that, the hinged ailerons may be bonded to each main wing panel. Finish each panel with the pushrods and control horns.

Joining the two panels is next. Thirty-minute epoxy is recommended here. Note the correct joiner orientation: flat on top. Now mix twice as much epoxy

and microballoons as you think you will need. Use a stick to spread the epoxy inside the joiner socket; spread epoxy on the joiner, and then spread a thin layer of epoxy over the root rib. The top of the wing should be flat.

Now bond the wing-bolt hardpoint into place. When you remove the covering from the areas to be bonded, be careful not to cut too deeply with the knife. I traced around the plywood plate with a Sharpie pen and trimmed the covering $\frac{1}{8}$ inch inside the line to make sure that the covering edge would be under the plywood when bonded. This will prevent the covering film's edge from curling up later on. Apply the epoxy while the wing is bolted to the fuselage. The blocks in my kit required a bit of chamfering to fit in the belly pan. Be sure to wax the bolts so that the excess epoxy does not bond them



permanently. Some strategically located masking tape can help control the excess oozing. When the epoxy has cured fully, remove the bolts and redrill the holes to remove the epoxy "threads." Finish the wing by CA'ing the belly pan to the lower wing surface. Supplement the CA by taping the front and aft faces to the wing.

• **Tail.** Epoxy the horizontal tail to the fuselage with the wing still bolted into place. Follow the instructions for the elevator installation, but make sure that there is adequate spanwise clearance for the balanced part of the elevator. Sanding the bonding surface of the torque rod will produce better adhesion. I recommend that you deviate from the instruction sequence here and install the main landing gear now. It will be much easier to have the fuselage on the gear for the next steps. Now you may epoxy the vertical fin into place and finish this phase with the rudder control horn, tailwheel and CA hinges. You are now ready to install the elevator and rudder servos with their respective linkages. The short, direct pushrods result in a very tight, slop-free control system.

• **Engine.** The instructions provide useful guidance for installing the recommended powerplants. My big O.S. 1.60, however, was a bit different. I chose to side-mount it with a Bisson Pitts-style muffler and a Perry VP30 fuel pump. The removal of a portion of the lower engine cowl was required so that it would clear the muffler and the additional cooling exhaust area. For trimming fiberglass, I use a Dremel Moto-Tool with a structured-tooth, tungsten-carbide bit. A sanding drum works well to smooth the edges. The instructions point out that you can cut material off, but you cannot put it back "on," so trim off only a little at a time. When you've cut the clearance for the muffler, the engine head and the needle, I suggest that you put a servo grommet in the needle-valve hole to prevent the vibrating needle-valve extension wire from damaging the cowl. If the



The Bisson Pitts-style muffler necessitated some cowl trimming. I used a Dremel with a tungsten carbide bit and removed small portions at a time to get the perfect fit.

cowl is warped, bolt it to the fuselage and heat it with a hair dryer (never get it so hot that you can't leave your hand on it). This will relax the fiberglass and temporarily permit it to assume the proper shape. The throttle linkage has a very narrow window to pass through. Take a look at where the

specifications

MODEL: Sukhoi 31

MANUFACTURER: Cermark

TYPE: aerobatic scale ARF

WINGSPAN: 68 in.

WING AREA: 846 sq. in.

LENGTH: 60 in.

WEIGHT: 10.5 lb.

WING LOADING: 28.8 oz./sq. ft.

RADIO SYSTEM REQ'D: 4-channel with 5 servos

RADIO SYSTEM USED:

Futaba 9 ZAP; one Futaba S9101 servo (throttle), two S9102 (elevator and rudder), two S3002 (ailerons)



ENGINE REQ'D: .90 to 1.08 2-stroke, 1.20 to 1.40 4-stroke, 23cc to 26cc gas

ENGINE USED: O.S. 1.60 FX

MUFFLER: Bisson Pitts-style with Perry VP 30 pump



PROPS USED: APC 18x6W, Mejzlik 18x6

PRICE: \$250

FEATURES: covered wings, tail and fuselage; symmetrical airfoil; painted cowl and canopy trim; complete with wheels, fuel tank and hardware.

COMMENTS: the high quality of Cermark's ARFs is apparent here. Fit and finish are superb, and the covering required only minimum touch-up. In the air, the model lives up to the Sukhoi standard and is very enjoyable to fly.

HITS

- Excellent quality and materials throughout.
- Superior fit and finish.
- Very complete kit.
- Great fun to fly!

MISSSES

- Canopy and engine-cowl attachments prone to fatigue.

fuel tank is and run the linkage just to the side of it; have it exit the firewall just above the muffler. I used a 3-line tank: fuel supply, overflow and fill/vent. I plumbed the overflow and vent straight down to exit through the cooling hole in the cowl. When there's fuel in the tank, you must plug the vent, or fuel will be siphoned out. (Robart hinges work well for this because after flying, you can use the other end to plug the overflow.)

Magnificent Pain: The Art of the Sukhoi

The world of serious, unlimited aerobatics, as seen from the inside, is primarily one of grunts and groans and the never-ending search for better and better machines that are capable of eliciting these grunts and groans.

Standing at the head of the search for aerobatic excellence is the Sukhoi design bureau in Moscow. For nearly 30 years, its beautiful but brutal airplanes have been at the pinnacle of aerobatic excellence while pretenders to the throne climb those slippery slopes. The most recent Sukhoi super machine is the 1992 Su-31.

Just sitting in a Sukhoi of any kind is an experience. The seat lies well back so that its pilot is semi-supine but doesn't have to reach forward for the control stick. The healthy-looking stick curves up between the pilot's legs and toward his chest—well within easy reach.

Starting the Vendenyev M-14P engine (an M-14PF with 400hp in the -31) is a kick because of its pneumatic starting system. One second, all is quiet in the relatively big cockpit, and the next, a prodigious amount of horsepower is galloping past in one of the most delicious rumbles you've ever heard.

Takeoff is the closest you'll come to being shot

out of a catapult because the Su-31 has one of the best power-to-weight ratios—well under 5 pounds per horsepower. Take a breath; drop the hammer; hang on!

On climbout in most aircraft, you have to be careful to hold the speed the handbook specifies is best for climb. In the Suke, it doesn't matter: you point the nose up at any ridiculous angle that blows your skirt and rumble upstairs as if the laws of gravity have been repealed.

Flying "akro" in any Sukhoi is more of a visual thing than anything else because there is virtually no feeling in the controls. As you move the stick, no pressure tells you where center is, so your first flight is likely to be a bobbing, weaving affair while you figure out how to calm your hand (and your heart). Once you've made friends with it, though, you own the world!

With that much power, anything with a vertical line in it can be as long and drawn out as you like. Vertical rolls? No sweat! Pull about 6G, which you hardly notice because of the seating position, glance out at



the left wing to make sure you're vertical, and slam in the aileron and a hint of rudder. The first ones will be ugly—count on it—because the horizon disappears in a blur, and the chances are good that you'll load the stick a little too much and corkscrew uphill. But you can corkscrew as far uphill as you like because the airplane won't slow down for a long time.

The airplane honestly doesn't care if it's right-side up or not. Push; pull; do anything you want, and it will do your bidding, no matter how illogical your request. When you come down, you'll hurt, and the next morning, my muscles you didn't know you had will ache. The grin, however, will last for a week. —Budd Davisson

With the O.S. 1.60 and an APC 18x6W prop, I had unlimited vertical in a serious way; in fact, the Sukhoi hovered at about 60 percent of throttle-stick position. The plane weighs 10.5 pounds, and with a full tank, it takes off at just under 11.5 pounds; I think the O.S. 1.60 yields about 14 to 15 pounds of thrust! This engine is one of the best-kept secrets in modeling! Its setup is the most user-friendly, it's reliable, and it's one of the easiest engines to start I have experienced in 30 years! I no longer even bother to remove my starter from the flight box. O.S. suggests that the mixture needle be set at 2.5 to 3 turns out and that the Pitts-style muffler does not provide enough pressure to ensure a uniform fuel flow. With the Perry VP 30 pump, I have the needle set to just under one turn out, and at full power, I have a nice, visible exhaust trail. I have

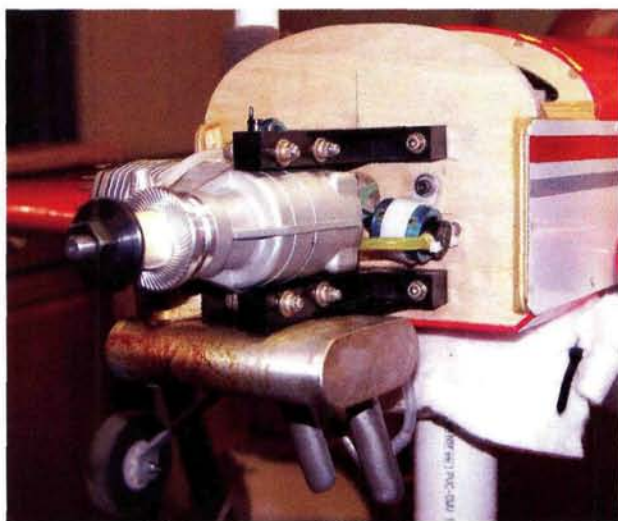
approximately 50 flights on the current glow plug, and it doesn't show any signs of degradation in starting, power, or idle reliability. With the Perry pump, the mixture is entirely uniform throughout the entire tank. With

shortest servo arm possible with the greatest travel volume. This will give you the most control resolution. There's ample room to position the receiver and battery pack to optimize the CG. Keep the battery position flexible; I think you will want to move it back after a few flights. Be sure to secure the long servo leads in the fuselage aft section so they don't flop about and even get pulled apart.

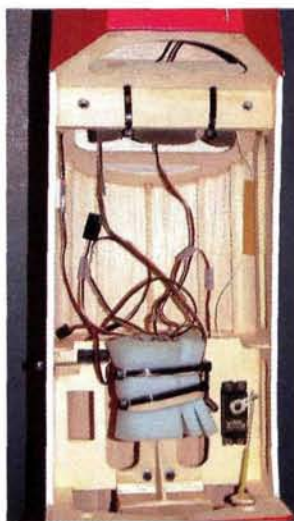
A few items warrant special mention. ARF manufacturers routinely provide very small screws for attaching cowls and canopies. This attachment method is not especially tolerant of high vibration. Before I install a cowl, I reinforce the screw holes inside with 1-inch-square CA hinge

material. This gives the thin fiberglass a bit more material for the screws to thread into. Then thread button-head 6-32 screws into the T-nuts. This setup allows you to really torque the screws down.

The instructions tell you to use what are



Left: the big O.S. 1.60 provides power appropriate to the Sukhoi's extreme aerobatic capability, and it produces less vibration than the recommended 1.40 4-stroke. Right: the radio box is huge, and it's a good idea to keep the battery position flexible so you can move the CG back to a more aerobatics-friendly location.



the 15-ounce tank provided, I have flown for up to 23 minutes! That is exceptional fuel economy in addition to ample power.

- **Radio gear.** Once the tank is in, screw the throttle servo into place. Use the

FLIGHT PERFORMANCE

You may wonder why I would put a 1.60ci engine on a plane spec'd for a 1.08. The answer comes in two parts: first, an O.S. 1.60 FX offers a lot of power—as much as some high-performance 4-strokes of similar displacement. The 2-stroke 1.60 produces significantly less vibration than a 4-stroke and therefore requires less maintenance. But, mainly, I wanted to be able to accelerate vertically in a positive, aggressive manner from low-level post-stall flight regimes. With the large-diameter, low-pitch prop, speed is not excessive, but when you over-power a model, you have to reduce power on down-lines.

TAKEOFF AND LANDING

As with any tail-dragger, you should take off with a smooth application of power. Hold full up-elevator to keep the tailwheel on the ground, and as you get to about 20-percent throttle, neutralize the elevator. Keep adding power, and at 70-percent throttle,



the plane will be off the ground whether you want it to be or not. Be handy with the rudder, but it should only take a little to hold straight. When you're comfortable with the plane, you can go vertical right after the wheels break ground.

Landing is fun and easy! The big, wide APC 18x6W prop serves as a nice airbrake, and this plane sideslips easily as well. Tailwheel landings are a snap.

LOW-SPEED PERFORMANCE

The Cermark Sukhoi slows right down when the power is pulled back. It has no apparent inclination to depart to the left or right. With the factory-suggested CG and deflections, the Sukhoi tolerates an

exceptional amount of "control abuse" without getting into any unrecoverable situations. In other words, it is a very predictable aircraft.

HIGH-SPEED PERFORMANCE

High-speed performance is completely docile, though you'll rarely use full power in level flight! Normal flight likes the 60- to 70-percent throttle range, and knife-edge can be sustained at this power setting. Full power is reserved for initial takeoff and vertical up-lines. Remember to pull the power back on down-lines!

AEROBATICS

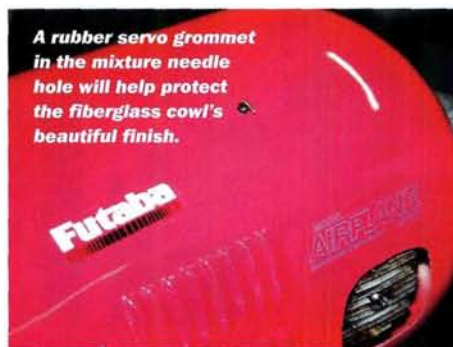
The Cermark Sukhoi 31 flies smoothly and tracks very well. The ailerons seemed to require a fair amount of differential for the aircraft to achieve an axial roll. It was difficult to spin and snap-roll at these settings; there simply was not enough control throw. After increasing the recommended throws by about 25 percent, I found that the plane would snap and spin. Two snaps on a vertical line are possible if you ease out the elevator once the snap has been initiated. Remember how the wing was constructed with the top surface flat? Notice also that the horizontal tail is low on the fuselage. These are not arbitrary deviations from scale. These two modifications have resulted in a plane that has nearly no yaw-induced coupling in roll or pitch! As a result, the Cermark Sukhoi is one of the easiest planes to do rolling circles with.

As I assembled the plane, I kept thinking that after exploring the conventional aerobatic flight regime, I would want to go beyond that. While hinging the control surfaces, I maintained enough of a hinge gap to achieve 45 degrees of elevator throw and enough rudder to hit the elevators at full travel. I then sealed the hinge gaps with clear adhesive tape. I set all the travel volumes to 140 percent on the transmitter, and I used servo-arm/control-horn combinations to give maximum control-surface deflections at the maximum servo travel. I then set my triple rates to be consistent with the suggested travel volumes for low rate; and to have a mid-rate, I set the throws to produce good snap maneuvers and the ability to climb in knife-edge. High rate was maxed out. The factory CG seemed quite nose-heavy, and I like the CG to be located so that variations from 50 to 100 percent power don't result in any pitch-trim change. These changes did improve response noticeably, but as the manual states, the Sukhoi is not intended to be fully 3D capable. But for everything else, the Sukhoi and the O.S. 1.60 make a potent combo.

essentially servo-mounting screws to install the canopy. I prefer to use a very flexible red plastic tape. You can go nearly all the way around with one piece. As long as you get the tape down before engine exhaust contaminates the surface, it will last forever. Be sure to close the open fuselage structure immediately behind the firewall—no sense in your giving the exhaust spew another contamination route into the fuselage.

PREFLIGHT

Set your radio up to use dual rates. Set the low rate to the factory-specified control-surface deflections, and set the high rate up to about 25 percent more than this. If you can, put all the dual-rate functions on one switch. Make sure that all the controls move in the correct directions, work freely and center properly. Verify that the CG is within the specified range. Be pre-



pared to add up-trim to elevator during your first flight.

CONCLUSION

I thoroughly enjoy the Cermark Sukhoi with the O.S. 1.60 aboard. The plane is one of the truest flying planes I have flown. It will fly most conventional pattern-type maneuvers very cleanly with little correction. With the

throws maxed out and the CG moved back a bit, it is a wild ride! If you have a little 3D experience, you'll have fun with this plane. The powerplant is now my favorite in this size and power range. And I'm excited that the Cermark Sukhoi 31, a Bisson muffler, a Perry VP30 pump and an O.S. 1.60 FX can all be purchased for about the same price as one of those whiz-bang, high-end competition pattern motors; this makes it a great value as well as a great deal of fun! ✚

APC; distributed by Landing Products (530) 661-0399; apcprop.com.

Bisson (705) 389-1156; info@bissonmufflers.com. Cermark (562) 906-0808; cermark.com.

Futaba; distributed by Great Planes (217) 398-6300; (800) 682-8948; futaba-rc.com.

Mejzlik (520) 722-0607; desertaircraft.com.

O.S.; distributed by Great Planes (217) 398-6300; (800) 682-8948; osengines.com.

Perry; perrypumps.com/products.htm.



INSIDE THE BOX

First, inspect the components. The box has foam inserts to prevent the parts from shifting during shipment, and inside, everything is poly-bagged. The manual is well laid out and organized and includes many helpful diagrams and pictures. The Fantana is covered in UltraCote, and the fiberglass parts are painted to match the covering. The kit includes a full set of hardware, pushrods, wheels, a fuel tank and a tinted canopy. You'll need to supply the usual building tools and adhesives to put the Fantana together.

BUILDING NOTES

- **Wing assembly.** As with most ARFs on the market today, assembly starts with the wing. It comes in one piece, and this greatly speeds up assembly. First epoxy the wing dowels into place, and then fit the wing in the fuselage. A single 1/4-20 nylon bolt holds the wing in place. Because I wanted to really wring this plane out in the air, I replaced the nylon bolt with a stronger metal bolt for extra security. This is one area where pilots who want to perform all-out aerobatics can never be too careful.

After I had secured the wing, I aligned and installed the horizontal stabilizer.

HANGAR 9

by Jet Thompson

Funtana S

.40 3D ARF

Rewriting the 3D rules

An axiom in RC flying states that "bigger flies better." With the Funtana S .40 ARF, Hangar 9 has proven that a well-built and -engineered .40-size plane can be just as stable and responsive as a much larger model.

Hangar 9 has built a reputation for high-quality ARFs, and the Funtana is no exception. From the simple and attractive UltraCote covering to the included fiberglass wheel pants and cowl, Hangar 9 has yet another winner. There has been a lot of buzz on the Internet about this aircraft and its abilities, so let's take a closer look.

Before you do that, make sure that the wing is square to the fuselage. In my case, the right wingtip was $\frac{1}{2}$ inch farther back than the left, which caused the plane to roll slightly to the right during hard pull-ups. I discovered this during the flight-testing. To fix the problem, I simply moved the bolt's blind nut $\frac{1}{4}$ inch to the right to square the wing. To ensure that the strength of the wing-mounting block wasn't compromised, I epoxied a piece of lite-ply to it.

• **Tail feathers.** The horizontal stab slides into a slot in the fuselage, and carbon-fiber



PHOTOS BY JOHN REID



Above: the aileron linkage is a snap to hook up. Right: the Saito FA-72 nestles nicely in the Funtana's cowl.

rods that brace the tail group provide a great deal of strength, which is critical for the punishment that 3D flying subjects the model to. I installed the stab, making sure that it was square and parallel with the wing. To install the carbon support rods, you are instructed to drill a hole $1\frac{3}{8}$ inches from the tip of the stabilizer and a corresponding hole in the fuselage. The rods in my kit were too short to allow them to fully seat in the holes, so I simply relocated the holes in the stab. I then glued the vertical fin into place and set the fuselage aside.

Now hinge the ailerons with the supplied CA hinges. I pushed a pin through the center of each of the hinges and slid them into the wing hinge slots, followed by the ailerons. There should be only a tiny gap between the wing and the leading edge of the aileron. The ailerons are truly huge and make up nearly a third of the wing. These large surfaces provide a lot of maneuverability and agility to the Funtana. When I was satisfied with their placement, I wicked plenty of thin CA into the hinges to

secure them. When I do this, I have a rag with some CA debonder handy in case I drip CA somewhere other than where it's needed. Let the CA cure naturally (without accelerator); the bond will be stronger.

I laid out the parts needed to install the elevators and rudder. Before I glued anything into place, I assembled the elevator halves with the joiner wire on my workbench. This is the perfect time to make any bends in the joiner wire so that the elevators lie flat and square. I hinged the elevators to the stab and let them cure, and I installed the tailwheel assembly. To make

the slot for the tailwheel straight and square, I used my handy little Robart drill jig and then cut the slot in the rear of the fuselage. I coated the tailwheel wire with petroleum jelly to prevent it from being glued to the bearing. I hinged the rudder into place and moved on to the engine installation.

• **Engine installation.** I elected to use the recommended Saito FA-72 4-stroke in this airplane. It has the quick throttle response and torque to perform the 3D maneuvers the Funtana S was designed for. The Saito is an excellent match for this plane, and with the proper propeller, it provides enough power to pull vertically out of a hover and do everything I want.

The Saito nestles nicely in the engine compartment, and the supplied mount fits it perfectly. The only quirk I encountered was that the throttle arm is a little too close to the firewall to allow a straight shot for the pushrod and clevis. I got around this by making the pushrod a little longer than called for and making a gentle 180-degree bend; this allowed the pushrod to be connected to the throttle arm from the front, clearing the firewall. I installed the provided fuel tank without a hitch.

For those of you who are thinking about powering the Funtana with an electric motor, an entire section of the manual details its installation. With a powerful Hacker B-50 10L brushless motor geared 6.7:1 and an 8000mAh 5s4p lithium battery

specifications

MODEL: Funtana S .40 3D ARF

MANUFACTURER: Hangar 9

DISTRIBUTOR: Horizon Hobby Inc.

TYPE: 3D fun-fly

WINGSPAN: 56 in.

LENGTH: 56 in.

WING AREA: 714 sq. in.

WEIGHT: 5 lb. 8 oz.

WING LOADING: 17.7 oz./sq. ft.

RADIO REQ'D: 4-channel with 5 servos

RADIO USED: JR XP8103 transmitter, 3 Hitec HS-605 (ailerons [2] and rudder), Hitec HS-525MG (elevator), Hitec HS-81 (throttle) servos

ENGINE REQ'D: .32 to .46 2-stroke, or .40 to .72 4-stroke

ENGINE USED: Saito FA-72 4-stroke

PROP USED: Pro Zinger 13x6 and APC 13x6W

FUEL USED: Powermaster 20/20 YS Saito blend

PRICE: \$169.99

FEATURES: built from laser-cut balsa and lite-ply parts; covered with UltraCote; complete hardware package; painted fiberglass cowl and wheel pants; tinted canopy; detailed instructions; decals.

COMMENTS: its confidence-inspiring control authority and light wing loading make the Funtana an excellent 3D performer. The very light wing loading enhances the outstanding aerobatic capabilities, while the thick airfoil makes slow flight a breeze. In fact, in a slight breeze, the Funtana can be brought to a virtual standstill while still flying on the wing. If you're looking for a fun-fly type of airplane that can handle just about any maneuver your thumbs can, this is the airplane to get.

HITS

- Excellent 3D performance.
- Painted fiberglass cowl and wheel pants.
- Easy to assemble.
- Short control linkages make for easy setup and adjustment.

MISSES

- Wing not perfectly square with fuselage.



(four parallel 5-cell packs wired in series), this plane would be amazing and quiet.

- **Cowl and landing gear.** For the cowl to fit over the engine, I had to cut a hole for the valve covers and engine head to poke through. I have found that the easiest and most accurate way to make the opening is to tape a piece of card stock to the fuselage with the cowl off and then trace the location of anything that protrudes through the cowl or that you need to access (glow plug, needle valve, fuel lines, etc.) onto the card stock. Remove the engine and put the cowl in place, and transfer the outlines from the card stock onto the cowl. Use a rotary tool and cutting bits to make clean cuts in the fiberglass, and wear a good dust mask.

The landing gear is mounted on the bottom of the fuselage with two screws, and the wheels are lightweight foam. The fiberglass wheel pants look great, but I found that I had to add an extra mounting screw to keep them in place.

Constructing this exceptional and beautiful airplane was easy, and I quickly became comfortable flying it.

- **Radio installation.** Installing the radio components is straightforward and quick. The location of the elevator and rudder servos in the tail shortens the linkages, and that eliminates slop, eases setup and makes adjustments a breeze, and standard-size servos fit the servo openings without a problem. The manual states that the Funtana will fly well with standard servos (around 45 oz.-in. of torque), and I have absolutely no doubt that it would. But I installed Hitec HS-605 servos on the ailerons and rudder for the extra torque and speed they provide. I also used a Hitec 525MG servo on the elevator; it is fast and has excellent centering characteristics. The pushrods are the typical push-pull type, and on the elevator, I decided to install the pushrod in such a way that, when in its neutral position, it would be angled downward steeply toward the control horn. With this setup, as the servo pushes the elevator in either direction, the linkage comes closer to being perpendicular to



The Father of the Funtana

If you have followed the Tournament of Champions for the past few years, you've seen the name Sebastiano Silvestri up there with competitors Chip Hyde, Quique Somenzini and Jason Shulman. This Italian superstar quickly carved out his spot as one of the world's leading innovators in 3D flying and airplane design. He has competed in several TOCs, is an expert in F3A aerobatics and is a freestyle master. He has amazed audiences all over the world. His very popular scale aerobatic design known as "the Katana" is based on the Terzi Katana, and his latest TOC version, the Katana S, has been seen in model-aviation magazines worldwide.

As the designer of Hangar 9's Funtana, Sebastiano's goal was to create a smaller version of his Funtana S 1.20, which he uses for 3D practice, and still have the same flying characteristics and the 3D capability of his large TOC Katana S. One distinctive feature of the Funtana S .40 is the tapered, constant-thickness airfoil. By using an airfoil section at the wing's center that is 11.5 percent of the thickness of the chord and a thicker, 20-percent airfoil at the tip, Sebastiano has been able to create a model that has stable low-speed characteristics much like his giant-scale aerobatic plane, yet it still flies very precisely. —Rick Bell



The throttle servo, the receiver and its battery go in the fuselage.

the elevator. This means that at extreme 3D travels, the pushrod actually pushes straight against the control horn (rather than up at an angle).

- **Final assembly and balancing.** All that was left to do was to glue the canopy into place and apply the decals. The canopy is already trimmed, and it fit



TAKEOFF AND LANDING

Takeoffs are typical for this type of airplane; they require just a bit of right rudder to keep the nose pointing straight until the tail comes up. With the Saito .72, power is not an issue, and if I accelerate quickly, the Funtana can be airborne before I have a chance to touch the rudder. After a couple of trim passes on the first flight, the Funtana was flying hands off.

Landing may actually be easier than takeoff with this plane (if that's possible!). On the first landing, I felt like a spectator; once I crossed the threshold of the runway and chopped the throttle, the Funtana just settled right down to the ground for a very nice landing. Landing on the main wheels, 3-point landings and even tail-first landings are all easily mastered.

LOW-SPEED PERFORMANCE

Slow and low is what the Funtana is all about. The control surfaces are so large that you can maintain control of the plane even when the wing is stalled—essential for an airplane that specializes in 3D maneuvers. In a slight breeze, you can bring the plane to a virtual standstill and still be flying.

HIGH-SPEED PERFORMANCE

This model isn't built for speed, but it will fly fairly fast. I definitely recommend that you keep the controls on low rates if you intend to fly fast, to prevent control-surface flutter.

AEROBATICS

The 3D maneuvers are where the Funtana really shines. It is without a doubt the easiest plane to hover and torque roll that I have ever owned. On the recommended high-rate elevator, waterfalls were a bit of a struggle, but with the elevator set to its mechanical limit, waterfalls are simple and tight. Harriers are easy to enter and exit, and there is very little wing rocking with about 25 percent of flaperon mixed with the elevator. Inverted flat spins are done with elevator and rudder and just a little aileron to keep the wings level. With full deflection on the elevator and a little coaxing, a climbing inverted flat spin is possible. Knife-edge performance is good, and there is some coupling toward the belly. High-rate rolls are blindingly fast and perfectly axial. The ailerons are huge and provide control in any attitude and at any speed. Point rolls can be done with mechanical precision. Snap rolls are predictable and quick, and loops track well. The Saito FA-72 provides enough power to climb out of a hover, but I wouldn't call it a rocket. All in all, the Funtana is a great-flying model.



A single servo drives the elevator; the rudder servo is on the other side of the fuselage.

perfectly; you need only glue it into place. To apply the decals, I used the box art as a reference.

I decided to balance my Funtana at the aft end of the recommended center-of-

gravity (CG) range, as I intended to fly on the wild side with the plane. The aft CG would make the controls more responsive. The tradeoff, though, is sacrificed stability. Even with the aft CG, the Funtana was still

exceptionally stable. If this is your first aerobatic airplane, I suggest that its CG be closer to the front of the CG range.

FINAL THOUGHTS

Constructing this exceptional and beautiful airplane was easy, and I quickly became comfortable flying it. With its thick wing and light, oversize control surfaces, the Hangar 9 Funtana S will deliver jaw-dropping 3D performance for experienced pilots and easy stable flight for sport pilots who aspire to learn 3D maneuvers. Give one a shot; you won't be disappointed! ✚

APC; distributed by Landing Products (530) 661-0399; apcprop.com.

Hangar 9; distributed by Horizon Hobby Inc.

Hitec RCD (858) 748-6948; hitecrd.com.

Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.

JR; distributed by Horizon Hobby Inc.

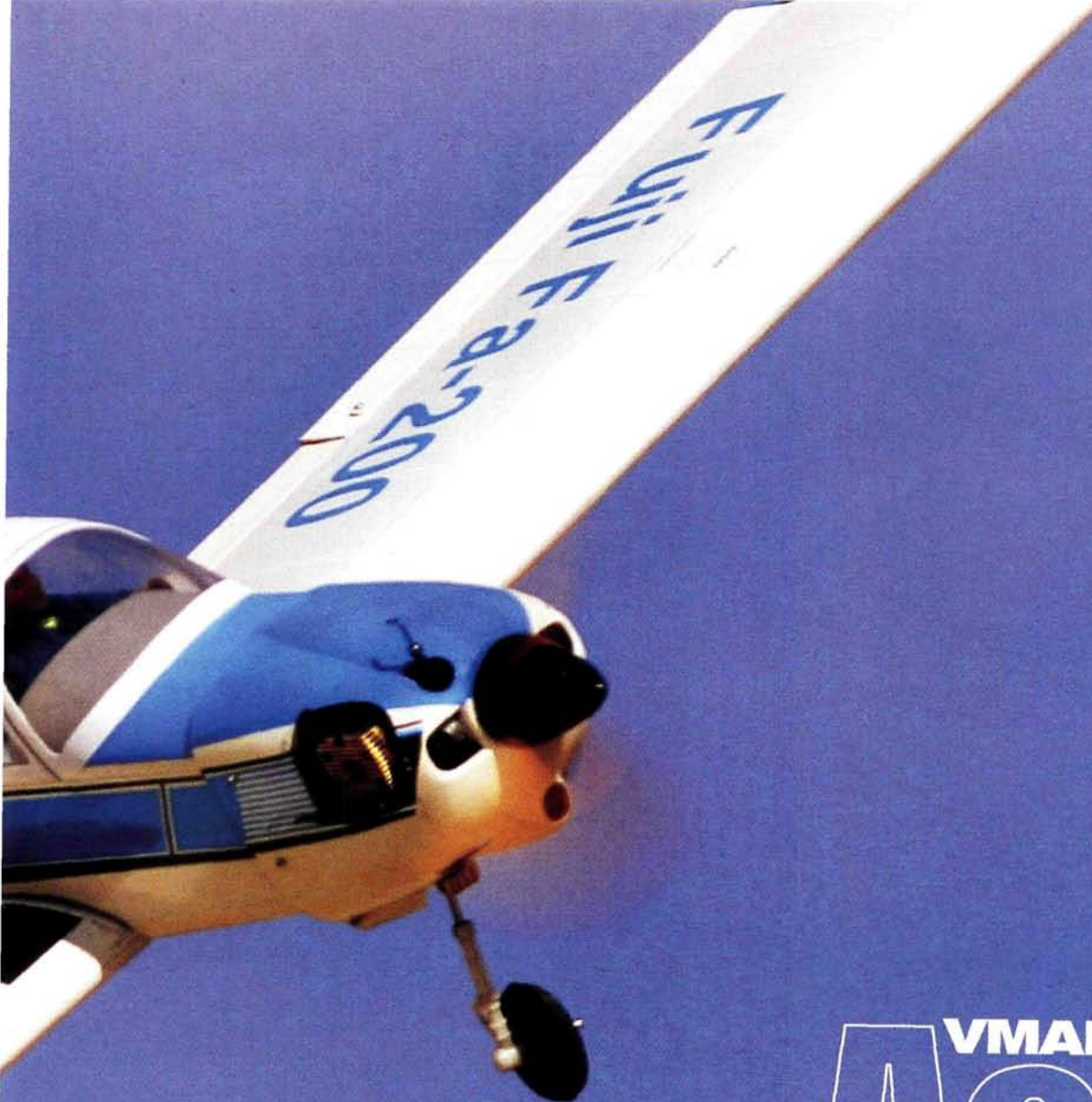
Powermaster (512) 285-9595; powermasterfuels.com.

Robart Mfg. (630) 584-7616; robart.com.

Saito; distributed by Horizon Hobby Inc.

Zinger; distributed by J&Z Products (310) 539-2313; zingerpropeller.com.





VMAR Aero Subaru

by Robert Reid

*High on
class, low
on cost*

The Japanese Fuji FA200 Aero Subaru, a product of Fuji Heavy Industries, is a little known general-aviation aircraft in the U.S. It's comparable to the venerable Piper Cherokee. Designed in 1964, the first prototype flew in August 1965. Now, VMAR brings us this sharp-looking civil aircraft in a nearly scale rendition. I have seen many VMAR products on the flightline but have never had the opportunity to build one—until now. You don't usually see such high-quality planes unless you scratch-build them, so I was anxious to get started on this beauty.



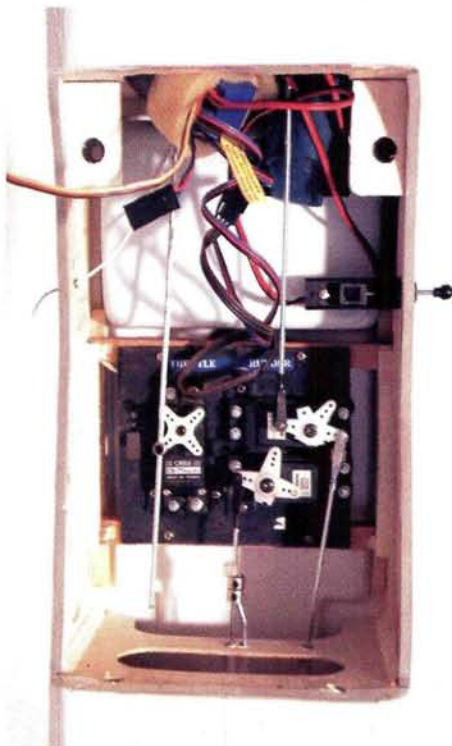
WHAT YOU GET

The VMAR Aero Subaru offers many unique features; the most obvious is the Polycote Enhanced Covering System (Polycote ECS). Unlike other multicolored models that have the trim colors applied over the base color and exposed to the elements, the Polycote ECS graphics are inside the covering and are totally fuel-proof. Other features include a painted fiberglass cowl that has the cutouts for the engine head, needle valve, etc., already done at the factory—quite a timesaver and one I really appreciated! The plane is of all-wood construction, and the engine mount, pushrods, hinges and pilot figure are all factory installed. You also get a complete hardware package, wheels, a spinner, gear struts, a fuel tank and a Pitts-style muffler that fits most popular engines in the recommended range. The 16-page manual is nicely done with detailed color photos of each step. VMAR sure gives you a lot for your buck!

CONSTRUCTION

• **Wing.** Assembly starts with the wing; a wing joiner and two 1/4-inch dowels join the wing panels together. Dry-fit them to the panels first, and then secure the dowels with CA. The manufacturer recommends that you use 30-minute epoxy to join the panels; this allows the epoxy to penetrate the wood for a stronger bond. I used low-tack masking tape to hold the panels together until the epoxy had cured and then applied the supplied tape around the joint to cover it.

The ailerons are already hinged and pinned, and I gave them a strong tug to



The molded servo tray fits any standard-size servo. The pushrods are installed at the factory.

ensure that they were, in fact, secure. On the underside of the wing are four openings—two for the aileron servos and two for the optional flap servos. When you remove the servo hatches, you'll see that VMAR has thoughtfully attached the hardwood servo mounts to their undersides. Because the openings for the flap servos are ready to use, I opted to install them. The flaps come as part of the ailerons and require that you cut them free; I used a razor saw to do this. Holes

specifications

MODEL: Aero Subaru

MANUFACTURER: VMAR

DISTRIBUTOR: Richmond RC Supply Ltd.

TYPE: semi-scale sport ARF

WINGSPAN: 65 in.

WING AREA: 698 sq. in.

LENGTH: 50 in.

WEIGHT: 6.5 lb.

WING LOADING:
21.46 oz./sq. ft.

ENGINE REQ'D: .40
to .52 2-stroke or
.52 to .70 4-stroke

ENGINE USED: VMAX
.46 Pro

RADIO REQ'D: 4-channel
w/5 servos, or
5-channel w/7 servos
with optional flaps

RADIO USED: Alirtronics
RD6000 w/7 servos

FUEL USED:
Powermaster

PRICE: \$129



FEATURES: all wood construction; Polycote ECS covering that's detailed with panel lines and rivets; painted and trimmed cowl; detailed cockpit includes instrument panel and pilot; EZ Mount Power Module with installed engine mount; factory-hinged control surfaces; installed pushrods; optional flaps; color-illustrated assembly manual; kit includes Pitts-style muffler.

COMMENTS: I have never had a scale-type model that builds so quickly and looks so good. The amount of assembly completed by the factory is just amazing, and it's a real standout on the flightline. Building the Aero Subaru takes minimum effort, and the detail in the Polycote ECS covering makes the model look as if you've spent many hours adding those fine scale details. Good looks aside, the plane flies very well and makes a great Sunday flyer.

HITS

- Excellent scale detailing.
- Power Module.
- Easy to assemble.
- Detailed instructions.
- Fun to fly.

MISSES

- I can't stop admiring it!

When I brought the Aero Subaru to the field, everyone was amazed by the simulated rivets, panel lines, instrument panel and pilot detailing. After a range check of the radio and some final engine adjustments, I was ready to go.

TAKEOFF AND LANDING

I taxied onto the active runway, pointed the nose into the wind and advanced the throttle. The Aero Subaru is smooth and quickly gains speed; it took off after about 60 feet. The plane climbed out nice and straight, and I only needed to add two clicks of up-elevator and some left aileron trim for hands-off level flight. The VMAX .46 engine offers more than enough power for this model. It is a lot quicker than I thought it would be; in fact, I flew at 1/2 throttle most of the time.



Landing the Subaru is quite easy, and it has no bad habits. Just set up a good final and ease back the throttle, and the Aero Subaru settles in for a smooth nose-high landing. Control response is effective right up to touchdown.

LOW-SPEED PERFORMANCE

The model slows down very well without tip-stalling or losing any stability. It has no tendency to fall off at slow speed. The stalls are straightforward, and recovery is just a matter of adding a little power.

HIGH-SPEED PERFORMANCE

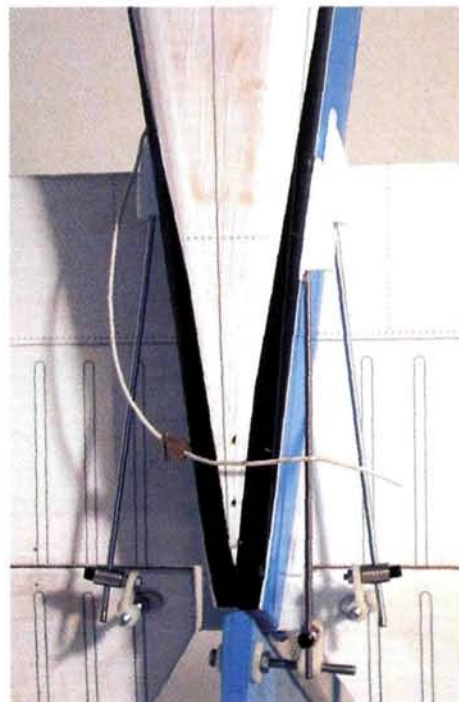
The high-speed performance of this aircraft is deceiving; it flies faster than it appears to. The control response to stick input is excellent. It handles more like a pattern ship than a sport-scale ARF.

AEROBATICS

At full power, rolls are crisp, and the rate is quick when you use the recommended control throw. Loops are easily accomplished from straight and level flight. The Aero Subaru easily handles scale-like and aggressive aerobatics; anyone with a little flying time won't have any trouble flying this beauty. It's a good plane to move up to after you've mastered a trainer.



Above: the Aero Subaru's cockpit is fully detailed and includes a full-body pilot figure. Right: attaching the pushrods to the control surfaces is straightforward.



for the control horns are already drilled in the ailerons and flaps, and setting up the pushrods was a snap. I jumped ahead in the instructions and installed the main landing gear; no surprises here.

• **Tail feathers.** The fuselage has two factory-cut slots at the rear for the stabilizers. I installed the horizontal stabilizer first and made sure it was straight and level. I epoxied it into place after I had removed the covering from its center section. When the epoxy had cured, I installed the vertical fin, again making sure that it was straight. Like the ailerons, the rudder and elevator are already

hinged and pinned, so you don't have to worry about this.

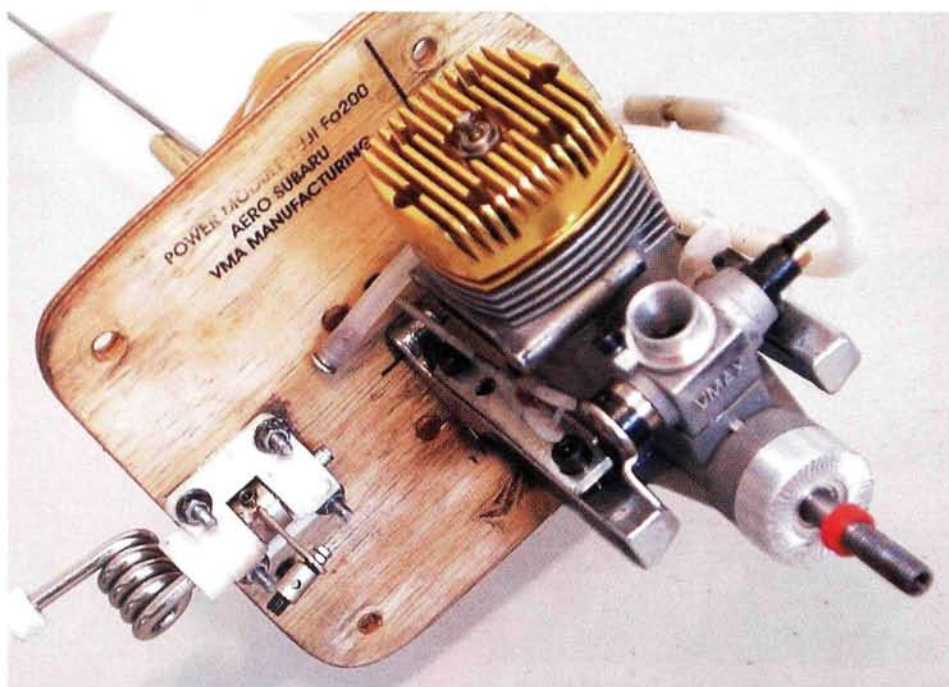
• **Engine installation.** There's not much to do here, thanks to the Power Module concept that VMAR uses. It consists of a firewall that's attached to the front of the fuselage on preinstalled studs. The firewall already has the engine mount and nose-gear bearing attached to it. On the back side of the firewall, glue two 1/4-inch dowels into predrilled holes and then secure the tank to them with rubber bands. I'm surprised that VMAR didn't plumb the tank.

The engine mount has retaining straps

to hold the engine, so you don't have to drill any holes. Just slip the engine under the straps and tighten them down. A Pitts-style muffler is included, and it is suitable for a .46 to .52 2-stroke engine. I used a VMAX .46 2-stroke engine, and the muffler fit it perfectly. After I had installed the engine, muffler, fuel tank and nose-gear assembly, I slipped the Power Module onto the studs and secured it with the supplied nuts and washers. I used some thread-lock on the studs to prevent the



Left: VMAR even includes scale-like landing-gear legs. **Above:** the cowl comes with the necessary cutouts already made and sized for most popular .40 to .52 2-stroke engines. **Below left:** here's the Power Module ready for installation; it's attached to four studs that protrude from the nose of the fuselage. Sure makes maintenance easy!



nuts from vibrating loose.

The painted cowl is already decorated and ready for installation. Simply slide the cowl over the engine, line it up, and attach it with the included screws.

• **Radio installation.** This starts with the pushrods. I first attached the rudder and elevator control horns and secured the pushrods to them. I removed the universal servo tray from the fuselage, mounted the servos as indicated and reinstalled the tray. The pushrods are already installed, and connecting them took just a few minutes. I then connected the throttle and nose-gear steering pushrods and adjusted them as necessary. Make sure that all fasteners are tight; the last thing

you need is to have a pushrod come loose during flight!

• **Final setup.** We're getting close now! The airframe is complete; setting the control throws and balancing the model are the last details before you head out to the field. The CG for the Aero Subaru is at $3\frac{1}{8}$ to $3\frac{3}{8}$ inches back from the leading edge; VMAR recommends the forward setting for the initial flights. By shifting the battery pack around, I was able to balance the model at the recommended CG without adding any weight. Do not forget this important step! I set up the control throws as recommended in the manual: elevator $\frac{1}{2}$ inch up and down, rudder 1 inch right and left, and

ailerons $\frac{3}{8}$ inch up and down. The instructions are very detailed and leave little to chance.

WRAP-UP

VMAR outdid itself with the Aero Subaru. This semi-scale kit is very complete, and quite frankly, with the amount of work that has been done for you, I'm surprised that it sells for only \$129! Not only that, Richmond RC Supply offers the powerful VMAX .46 2-stroke engine for \$49.95 with the pur-

VMAR sure gives you a lot for your buck!

chase of a kit. Now that's a deal that's hard to beat!

This model will get your heart pumping and make you look like a pro builder. Whether you're a novice or an expert, you will really enjoy building and flying the VMAR Aero Subaru. ✦

Airtronics (714) 978-1895; airtronics.net.

Powermaster Hobby Products Inc. (512) 285-9595; powermasterfuels.com.

Richmond RC Supply Ltd. (877) 727-2329; (604) 940-1066.

VMAR; distributed by Richmond RC Supply Ltd. VMAX; distributed by Richmond RC Supply Ltd.



DYNAFLITE Bird of Time ARF

by Dave Garwood

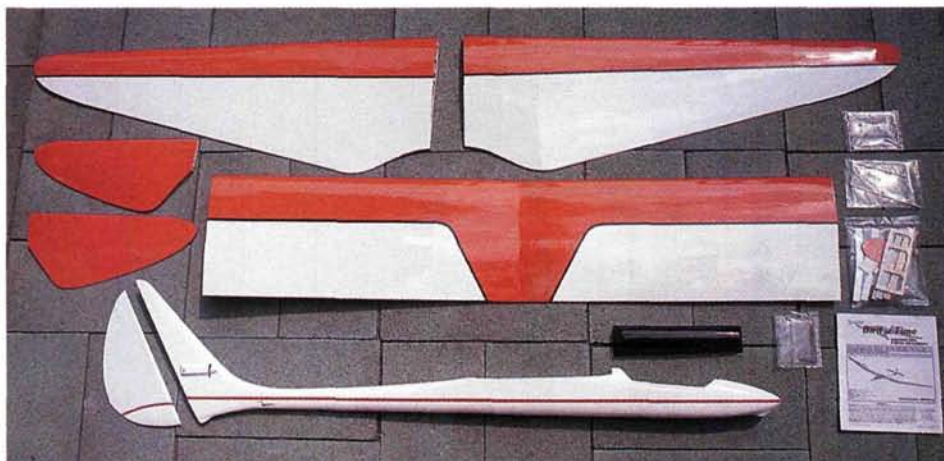
Return of a classic sailplane

For many years one of Dynaflyte's most popular kits, the Bird of Time (BoT) sailplane is now being offered by the company in an almost-ready-to-fly (ARF) version. The BoT's distinctive wing planform and legendary flight performance combine to make it a classic that's immediately identifiable. With minimal building time and inexpensive radio gear, you can enjoy the majestic beauty and magnificent flight characteristics of its 3-meter-span, thermal-soaring design.

The BoT design was created by Dave Thornburg for F3B multitask soaring competitions in the 1970s back when "iron men in wooden ships" reigned at such contests. With the availability of more modern materials and designs for full-on competition machines, the wood-en-wing BoT is now more suited to lazy-day sport flying, and it's also perfectly at home in rudder-and-elevator-only contests. After three decades, it is still one great soaring machine.



My son and I—two generations of sailplane pilots—were greatly impressed with the Dynaflyte Bird of Time ARF's flight performance. (Photo by Paula Garwood.)



Dynaflyte's Bird of Time ARF arrives with built and covered wing panels and tail parts, an excellent molded-fiberglass fuselage finished in glossy white and with a decorative stripe, a tinted canopy, the hardware needed to complete the kit and a 20-page instruction manual.

KIT CONTENTS

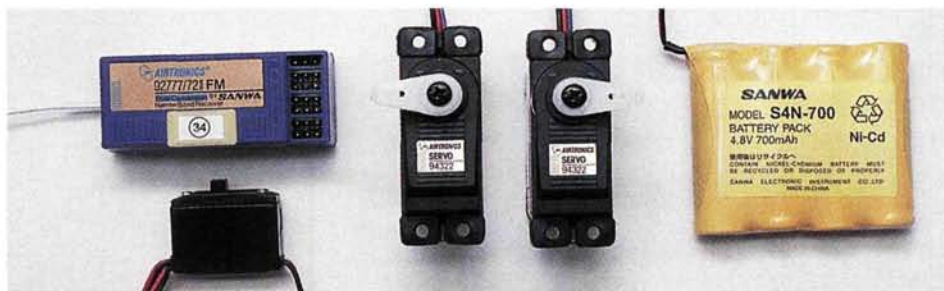
The BoT ARF arrives almost entirely built. The kit includes an immaculately molded, shiny white fuselage with expertly filled seams and to which a decorative stripe has already been applied. The vertical stabilizer is part of the molding, so you don't have to mount and align a fin. The elevator-pushrod guide and an antenna tube are already installed, and the nose weight is in place.

Three built-up balsa wing sections come covered in Top Flite MonoKote film in an attractive color scheme, and a large decal of the "Bird of Time" logo is included. The complete hardware package provides the towhook, pushrods and all the necessary small fittings; a dark-tinted canopy and an extensive, 20-page instruction manual that contains eight drawings and 34 photographs round out the kit.

CONSTRUCTION

I completed construction of this prebuilt kit in just 7½ hours over the course of a week. The first order of business is to install the servos and elevator pushrod using Goop glue, which I find does a splendid job of joining wood, plastic, foam and fiberglass parts. The instructions call for a standard servo to be mounted in the tray for the elevator and a microservo with an extension cable in the tail for rudder, but I decided to build a new servo tray to accommodate two standard servos (see "Click Trip") to avoid having to use the long extension cable because it can cause the servo to jitter.

Epoxy the wing-joiner assemblies, and while they cure, install the elevator pushrod, if you have decided to put both servos up front. Holes for the second



The onboard radio gear selected for this project: Airtronics 92777 7-channel receiver, a pair of 92322 standard-size, ball-bearing servos, 95008 battery pack and 97001 switch harness.

The well-written manual presents substantial information on flight preparation and flight safety. For an advance peek at it, you may download a copy from Dynaflite.com/manuals/index.html.

Little else is needed to build the sailplane; only medium CA, epoxy, Goop glue, wing-joining tape, common hand tools and a 2-channel radio. The manual also lists 20 optional supplies and tools.

pushrod are provided in the pre-installed bulkheads, but you'll have to curve and firmly mount the rear end of the elevator pushrod. Some of the fuselage seam-joiner fiberglass tape was unattached on my fuselage, so I affixed it with epoxy and used a clothespin to hold it in place overnight.

Carefully fit the wing joiners; I had to grind mine a little. Then fit the rudder. The slots for the rudder hinges were out of

specifications

MODEL: Bird of Time ARF

MANUFACTURER: Dynaflyte

DISTRIBUTOR: Great Planes Model Distributors

TYPE: thermal duration sailplane, unlimited class

LENGTH: 50 in.

WINGSPAN: 117 in. (3m)

WING AREA: 1,050 sq. in.

WEIGHT: 55 oz.

WING LOADING: 7.5 oz./sq. ft.

RADIO REQ'D: 2-channel (rudder and elevator)

RADIO USED:

Airtronics VG-6000 transmitter, 92777 receiver and 2 standard-size Airtronics 94322 ball-bearing servos



PRICE: \$139.99

FEATURES: prebuilt airframe with molded and finished fiberglass fuselage and installed pushrod guide; built and covered wings, stabilizers and rudder; complete hardware package, tinted canopy, decals and detailed instruction manual.

COMMENTS: the three-section wing and removable horizontal stabilizers make it easy to store and transport this large sailplane. Launch it gently, and you'll be rewarded with exceptional thermal performance.

HITS

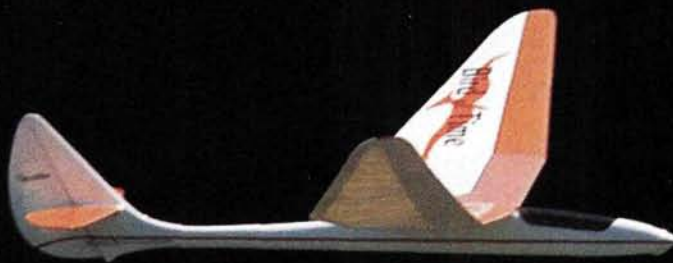
- Distinctive appearance.
- Excellent thermal performance.
- Beautifully molded and finished fiberglass fuselage.
- MonoKote covering on wing, stabilizers and rudder is extremely well done.
- Complete hardware kit even includes nose weight.

MISSES

- Precut rudder hinge slots and elevator control rod slots were misaligned (builder can easily re-slot and enlarge).

alignment, but it was easy to cut new ones.

Now install the rudder control horn, and assemble the rudder and elevator control-cable fittings. On my BoT, the elevator control rod rubbed against the crescent-shaped cutout in the fin, but I easily corrected this with a Dremel Moto-Tool (you could also use sandpaper). Epoxy in the wing-incidence pins and the wing's leading-edge mounting pegs.



TAKEOFF AND LANDING

With the towhook in the second position on the fuselage, my Bird of Time was perfectly well behaved on high-start and winch launches; it climbed steeply without any tendency to pop off. The wings bowed upward on launch, but with careful application of the winch pedal and without attempting a zoom launch, I had no problems with wing strength.

Give yourself plenty of room to land because its 3-meter span gives the BoT a long, flat glide. On approach, pull back on the elevator stick to raise the nose slightly; this slows the plane noticeably, but allows you to maintain strong rudder control, so you'll have no problem keeping the wingtips level. Builders, take note: spoilers would be a useful addition for precise spot landings.

HIGH- AND LOW-SPEED PERFORMANCE

This is a lightly built thermal-duration glider, so don't expect racer speeds, but it must have a magic airfoil section because the range of speed available is impressive. When slowly cruising, the BoT exhibits no tendency to stall forward or tip-stall, yet if you push the elevator stick forward, you get a pleasing burst of acceleration—something not seen in every stick-built glider.

Furthermore, the speed is useful for escaping sink and covering ground to get to the next thermal.

THERMALING AND AEROBATICS

When you find lift, the Bird of Time really struts its stuff. It takes you to a whole new level of thermal climbing performance (especially if you've been flying 2-meter gliders or have been struggling with an aileron glider in thermal turns). The polyhedral break angles are perfect for carving and holding a thermal turn; this BoT shows no tendency to close in on the circle. It holds the turn solidly and just goes up and up and up. My BoT quickly climbed to "speck" altitude three times, and I had to bring it down with loops and spins, or I would have lost sight of it.

Loops and spins are the extent of the Bird's aerobatic arsenal. The airframe handles big, graceful loops easily; just enter the maneuver with a brief preparatory dive to gather speed. You'll be amazed by how strongly the sailplane resists stalling, but the safest way to get a wooden ship down from altitude quickly is to pull its nose up until it stalls, hold full up-elevator and full rudder, and watch it enter a spiral spin. Release the stick, and it recovers immediately on its own.

Fit the rear-wing hold-down plate and apply epoxy to another area on the loose seam tape. Install the adjustable towhook mount with Goop, and allow the adhesives to cure overnight.

Assemble the sailplane, and then check its center of gravity (CG), lateral balance and wingtip washout. To balance at the recommended point, mine needed $\frac{3}{4}$ ounce of additional nose weight, no wingtip weight and no washout adjustment. Cut a piece of foam for the receiver mount, which also holds the battery pack in place.

FLIGHT PREPARATION

The instruction manual covers in detail how to confirm and adjust the fore-and-aft CG balance, the wings' lateral balance and the control-surface throws; all are important to the way the plane flies. It's also important to check wing washout. You want the wings to have a slight twist so that the tips' leading edges are down and their trailing edges are up when compared with the center of the wing. This is so that the wing center stalls before the tips and causes the stalled airplane to fall straight forward (easier to control) rather than to tip-stall first (more difficult to control).

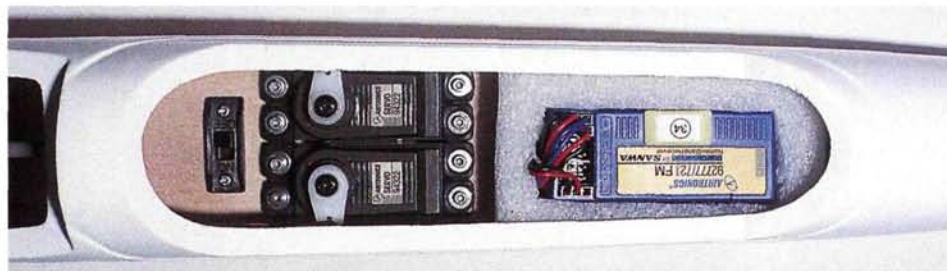
The tips' distinctive shape makes it

impossible to check for washout in the traditional way (holding the wing halves flat on the workbench). I used an incidence gauge to check my wing washout and found it to be slight—about 0.5 degree at the longest-chord portion of the tips (mine flew fine).

Another way to check washout is by carefully sighting along the wing as a

wing can break if it's overstressed, e.g., "Do not attempt full pedal launches with the Bird of Time ARF." See dynaflite.com/techsupport/dyfa0500tech.html.

The second notice extends the recommended CG balance-point range from 3.75 inches to 4.125 inches behind the wing's leading edge. It further cautions: "If you launch your Bird of Time ARF with a



Onboard radio gear installed. The receiver nestles in foam that was cut for the purpose; the servos and switch are mounted in a plywood shelf that I built.

helper rotates the plane's pitch up and down. If insufficient washout is found, correct it with a heat gun, as a lack of it can contribute to tip-stalling.

Updates to the manual are available online, and two in particular are worth reading. The first concerns the sailplane's wing structure; it emphasizes that the

powered winch, you must use care to avoid structural damage."

Last, before you head to the flying field, make sure that the covering film is tightly attached and wrinkle-free. You may have to go over the wing and tail parts with a covering iron or a heat gun. Ready to fly? Let's rock.

FLYING THE BOT ARF

Any assembly and setup tribulations are quickly forgotten when you see the BoT climb in a thermal. This sailplane flies quite well. The span generates plenty of lift, and the airfoil delivers a surprising range of flight speed. My first four launches were from a small high-start in light wind, and though the tips bowed upward, they made no cracking or creaking noises, and they certainly did not break. It was late in the day, and I didn't find lift, but I confirmed the BoT's pleasant flight characteristics and suitability of the recommended control-surface throws and second-hole towhook position.

My second flying day was at the annual Charles River Radio Controllers RES (rudder, elevator, spoiler) contest in eastern Massachusetts. I took it easy on the launch pedal and didn't have any problems in five launches on a 12V contest winch. It was a glorious day for thermal flying, and I got to "speck" altitude twice and had to spin the BoT down to land to stay within the time limit. It handles well and presented no problems landing within the circular target.

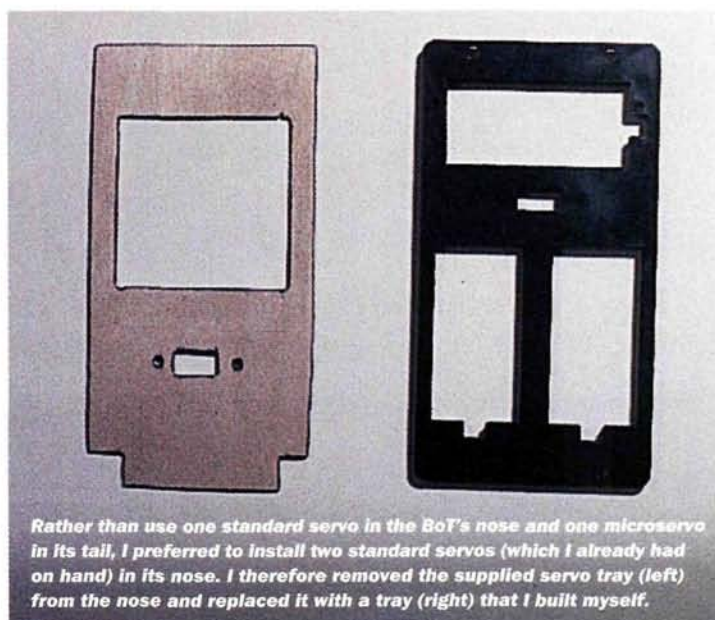
The following weekend, with five more careful winch launches and one more extreme "speck" flight, I observed no

wing-strength problems when I launched it carefully. With 14 flights on the airframe, the Dynaflyte Bird of Time ARF has proven itself a worthy open-class polyhedral sailplane. Its ability to carve a thermal turn and to soar in lift makes it a suitable open-class sailplane for beginners and intermediate pilots.

Because this celebrated design flies so blazingly well and the ARF version comes built and expertly covered—and at an attractive price—it's easy to recommend the Dynaflyte Bird of Time sailplane kit for both sport flying and RES competition. ✦

Airtronics (714) 978-1895; airtronics.net.

Dynaflyte; distributed by Great Planes Model Distributors.



Rather than use one standard servo in the BoT's nose and one microservo in its tail, I preferred to install two standard servos (which I already had on hand) in its nose. I therefore removed the supplied servo tray (left) from the nose and replaced it with a tray (right) that I built myself.

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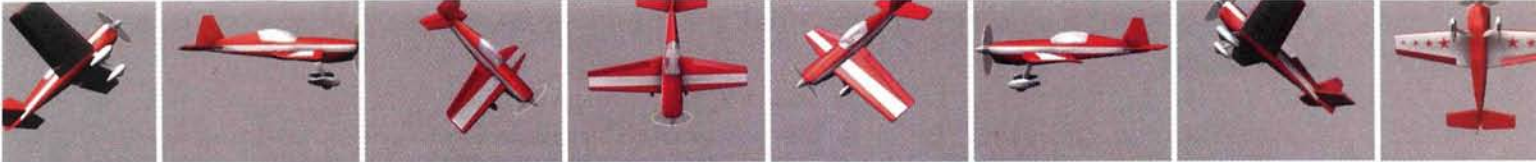
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Freestyle Aerobatics





Rolling loops & circles

by Quique Somenzini

Rolling loops and circles are among the most difficult aerobatic maneuvers to perform. And just like other freestyle maneuvers, they have certain control-setup requirements. One is to adjust the control rates for this specific maneuver. Just using dual rates will allow you to do these maneuvers—with lots of practice. But if you want to execute them at world-championship caliber, setting up a separate flight mode will greatly help you. Let's have a look at this spectacular maneuver.

Rolling loops and circles are basically the same maneuver but they're executed on different planes: rolling loops on a vertical plane and rolling circles on a horizontal plane. During both maneuvers, the airplane will have to turn or climb 360 degrees while it's rolling. The roll rate as well as the radius (or diameter) of the circle or loop also needs to remain constant. If you're adventurous, you can do other maneuvers such as rolling Cuban-8s, rolling reverse Cuban-8s and rolling humpty bumps. If you've seen a recent giant-scale aerobatic event, I'm sure that you've noticed that rolling maneuvers are very popular in freestyle aerobatics.

HOW TO DO IT

I learned to do rolling loops in 1980 and first introduced them at the Holland F3A World Championships closing airshow in 1985. The key to this maneuver is to make the airplane turn, or climb, while it's rolling. To accomplish this, you need to use the rudder and elevator to steer the airplane. Let's imagine that you will roll to the right and do a loop entering from an upright position. This is known as an inside rolling loop. To start, don't worry about the number of rolls; you can add or subtract rolls later. First, start rolling to the right; it is better to do the roll slowly, as it makes it easier to time control inputs.

As soon as the airplane starts to roll, apply a few degrees of left rudder to yaw the tail down and move the nose of the airplane up. As the airplane rolls, the amount of rudder input will increase until it reaches the nose-up position. Now, ease off the rudder and start to apply some down-elevator to keep the airplane looping at the same radius. Just like rudder input, the amount of down-elevator applied will increase until the airplane is upright. At this point, a half-roll has been completed.

Continue rolling right while keeping the roll rate constant. From upright to nose-down, the rudder will slowly move from left to right and be neutral when the airplane is halfway in between. When pointed down, the rudder will stay to the right to keep the nose of the airplane

yawing into the loop. The right rudder will progressively increase and reach its peak a few degrees before reaching nose-down. By now, $\frac{3}{4}$ roll will have been completed. At the nose-down position, start to add up-elevator to keep the airplane yawing (tail out and nose in). Between $\frac{3}{4}$ and a full roll, move the rudder from right to left, ending back in the starting position. As you practice the maneuver, you'll see that timing the rudder and elevator inputs is critical to keep the airplane's nose yawing and the radius of the circle constant.

ROLLING CIRCLES

Rolling circles are done basically the same way, only you're turning instead of climbing. To make the radius of the circle round, you'll need to use less rudder input when at knife-edge and less elevator input when the airplane is inverted. By changing and combining both controls in the same manner as you did with rolling loops, you'll be able to make the airplane roll and circle at the same time. Now that you have an idea of how to execute the maneuver, let's take a look at the radio setup.

SETUP TIPS

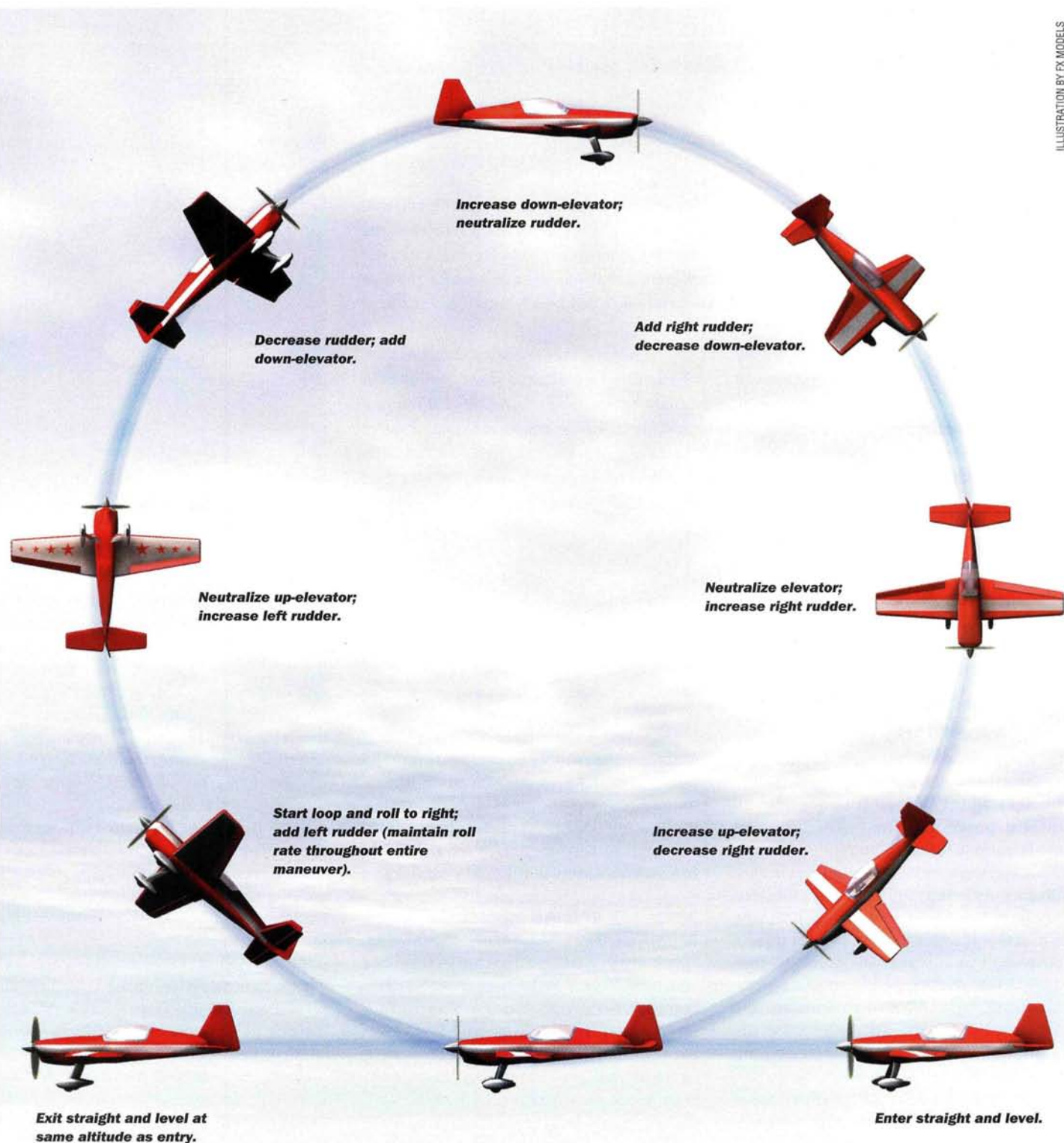
For rolling loops and circles, you need to use more rudder throw than what's needed for general flying. Also, when the number of rolls decreases in the maneuver, rudder throw has to increase still more; a single roll per loop or circle demands the



most from the rudder. The elevator rate stays the same as during general flying and should work fine. Reducing aileron throw will help make controlling the roll rate easier and constant. The most common mistake pilots make is to use too much aileron; this can produce an inconsistent roll rate during the maneuver.

I like to fly my airplanes with a lot of rudder, as I feel this works better for the mode I fly (mode 1). With both elevator and rudder on my left thumb, I try to have the airplane feel balanced with about the same control authority. Stick movement will then be more or less symmetrical—moving about the same for left/right and up/down. Other pilots use very little rudder for general flying and adjust their airplane so it will fly at knife-edge with the throttle at full bore. The airplane should climb at full throttle in a knife-edge. Either method will work; it's just a different way to feel the airplane. If you are in this last group of pilots, you'll probably find it better to set up a flight mode or to use dual rates on the rudder. Dual rates will work, but a flight mode will allow you to adjust the airplane to perfection!

Here is one little secret that I want to share with you. To make rolling maneuvers easier to do, your airplane must track without any pitch or roll coupling in knife-edge flight when the rudder is used. If your airplane has these tendencies, go back and check the model's incidence, CG location, etc. If all is correct, you'll need



to use program mixing to remove the coupling. If it's roll coupling, then mix rudder to aileron, and if pitch coupling, mix rudder to elevator. Adjust the mixes until the plane will do a perfect knife-edge. Refer to the "Freestyle Aerobatics" article in the February 2004 issue of *Model*

Airplane News on how I set up mixes. When the airplane is set up properly, it makes it so much easier to do rolling loops and circles. Before you start to practice, I strongly recommend you trim your model for straight and true knife-edges. Once your airplane tracks straight, play

with rates until you find the one that suits you best, and then program those values into a flight mode.

Now that you know everything about rolling loops and circles, get out there and practice! ✈

*The first aircraft built by
the Granville brothers!*



Gee Bee MODEL-A

Of all the colorful biplanes that have flown throughout the years, one in particular has been overlooked by the modeling world: the Gee Bee Model-A. I decided to model the Gee Bee biplane (registration no. 3086) for several reasons: I had many good photographs of it; it's historically significant; and I like its color scheme.

My model is a $\frac{1}{6}$ -scale reproduction, and I power it with an old Enya .60 engine, which does a very nice job. With its 60-inch top wingspan, the Gee Bee biplane is IMAA-legal. The full-size airplane flew frequently during the winter, so I built a set of scale skis for my model. The details are on the plans, as are patterns for a set of scale Kinner engine cylinders.



by Henry Haffke

BIPLANE

CONSTRUCTION HIGHLIGHTS

The Gee Bee biplane is similar to other models I have designed and uses fairly simple construction techniques. The fuselage is nothing more than a box structure made of solid sheet-balsa sides with formers and crosspieces added. The aft turtle deck uses top formers and stringers; the forward section is sheeted, and I carved balsa blocks to shape to make the engine cowl.

The plans include all the full-size patterns needed to build the model, including details to make scale Kinner engine cylinders. All cabane-strut and landing-gear music-wire patterns are also included. The tail surfaces are shown in scale size, and an enlarged outline is also available for sport modelers who are less concerned about scale appearance. The plans show details for the prototype aircraft (shown in this article) and for the production version.

WINGS

The wing construction is very straightforward, and all the rib patterns are shown on the plan. Note that the rib spacing is scale, and the distances between them vary from bay to bay. The top wing is flat, and the lower wing has dihedral (the ply dihedral braces are shaped to produce the proper amount of dihedral). Though the model looks as if it has four strip ailerons, only the bottom wing has them. The top wing has full-length flaps that can be adjusted to alter the wing's shape. You could operate these with a servo, but I simply adjust them by hand using the scale linkage at the center of the wing. The ailerons are built using a bottom sheet with ribs and leading-edge pieces glued on top. This is also how the tail surfaces are constructed. The technique is quick and produces light, strong results. (Detailed construction notes are available to be downloaded; take the *Model Airplane News* "Click Trip.")

specifications

MODEL: Gee Bee Model-A biplane

TYPE: 1/6 scale

WINGSPAN: 60 in. (top)

WING AREA: 945 sq. in.

WEIGHT: 8 lb.

WING LOADING: 19.5 oz./sq. ft.

LENGTH: 40.75 in.

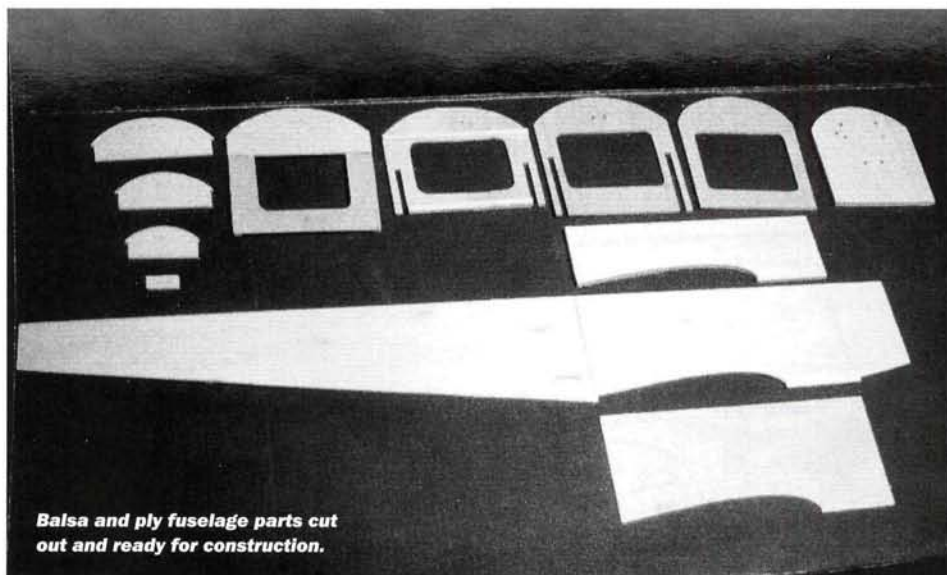
ENGINE USED: Enya .60 2-stroke

RADIO REQ'D: 4 channels (rudder, elevator, aileron, throttle)

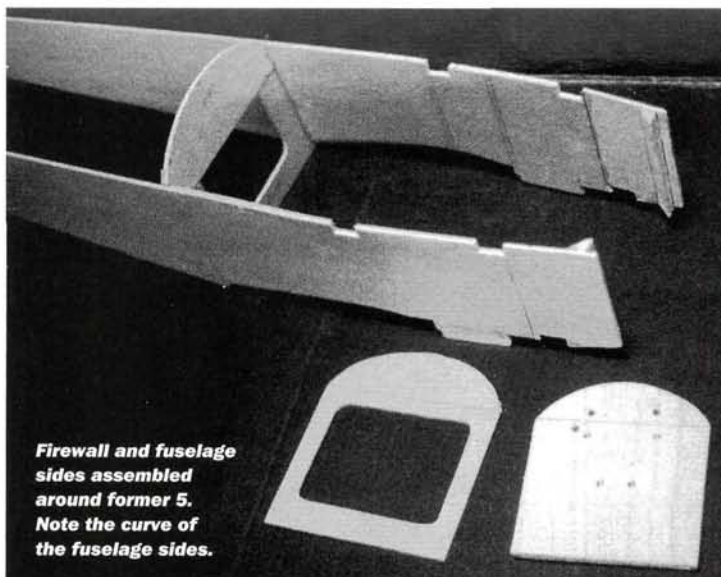
RADIO USED: Futaba

PROP USED: Top Flite 12x6

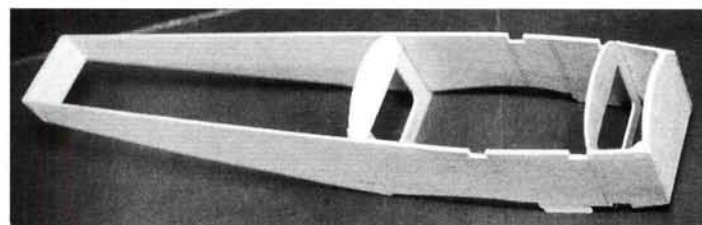
COMMENTS: designed by Gee Bee expert Henry Haffke, this 1/6-scale model is a faithful reproduction of the Model-A biplane—the first aircraft built by the Granville brothers. The model has a traditional balsa-and-plywood construction and is simple and strong.



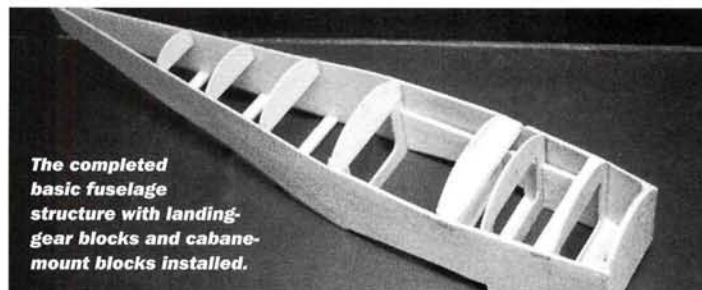
Balsa and ply fuselage parts cut out and ready for construction.



Firewall and fuselage sides assembled around former 5. Note the curve of the fuselage sides.



The firewall and two bulkheads have been installed. Notice the temporary tail spacer.



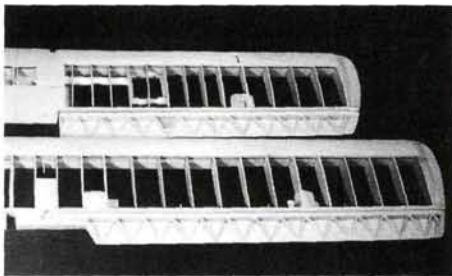
The completed basic fuselage structure with landing-gear blocks and cabane-mount blocks installed.

I used Pacer Zap CA and epoxy throughout the construction. To finish the model, I used Coverite's 21st Century painted covering material. I cut all the trim work and the markings out of fabric of different colors and ironed them directly onto the base fabric. The plans show all the trim and marking patterns.

You can build the model with as much or as little detail as you like; its outline is scale, and with a little extra effort, you can produce a competition-worthy scale model. (You'll find scale drawings in the Click Trip.)

FLYING

I had never designed a biplane before and wanted someone with biplane experience to check it over and test-fly it for me. I



Top: the completed, ready-to-cover wing, aileron and flap structures. Above: this shows the wing-alignment jig pieces clamped to the bulkheads. This will set the proper wing incidence.

asked my good friend Nick Zirola, and he was happy to help out. We met at his club field, where he checked the model thoroughly. We moved the CG forward a bit, and I fueled it up. I started the engine, and Nick taxied into takeoff position. After a short run, the model left the ground, and Nick reported that it needed

**I hope you enjoy
building and
flying the
Gee Bee Model-A
as much as I have!**

downtrim but was flying nicely. It was a beautiful sight in the air. Nick made several low passes so that I could shoot some pictures, and then he brought it in for a flawless smooth landing.

I adjusted the elevator linkage so that we had some downtrim with the trim lever centered. On the second flight, Nick did a few maneuvers and then handed me

The Granville Bros. Aircraft Service

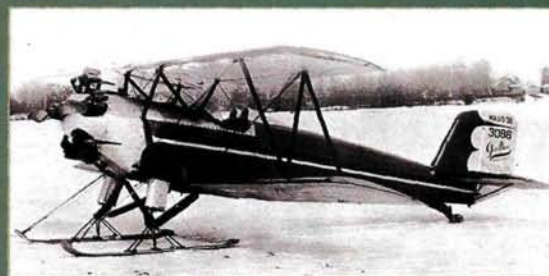
Did you know that the first aircraft built by the Granville brothers was a biplane? The five brothers—Zantford, Tom, Robert, Mark and Ed—grew up in the small town of Madison, NH, where they helped out on the family farm.

After finishing school and working as a mechanic for Chevrolet in Boston, Zantford opened his own Chevrolet dealership. He was interested in aviation and enjoyed helping mechanics with their work on airplanes. He was eager to fly and spent part of his earnings on flying lessons. He got his brother Tom to join him so that he'd be able to spend more time at the airport.

Tom wanted to open his own aircraft repair shop at the local airport, but he found this wasn't possible; field restrictions prohibited further construction on the site. Instead, he built a portable shop on the back of a big flatbed truck that he drove

from behind the instrument panel to free up cockpit space. With a twist of the instructor's wrist, the dual stick was instantly released from the student, and the instructor would take over. The rudder and elevator control surfaces were interchangeable, as were the upper and lower wing panels, the flaps and the ailerons.

The Gee Bee Model-A, powered with a 60hp Velie M-5 engine, was completed in three months.



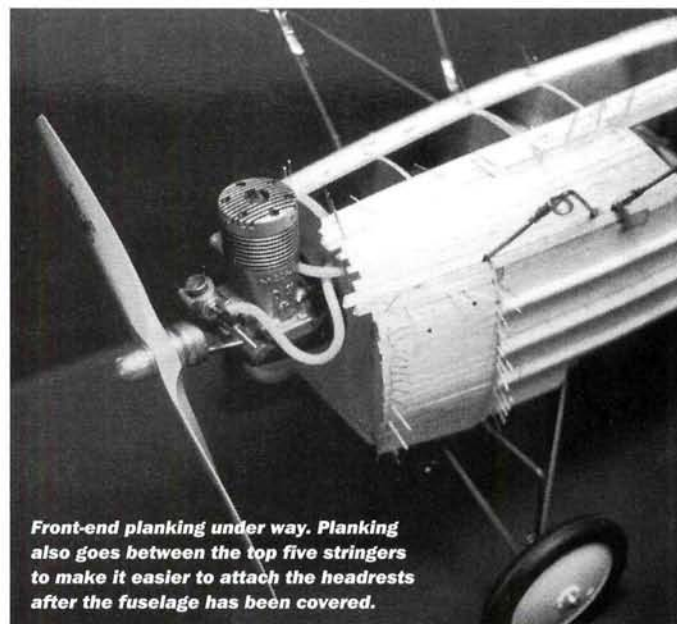
Top: Zantford "Grannie" Granville with his new Gee Bee airplane powered by its original 60hp Velie engine. Center: "Grannie" waits for a helper to start the 113hp Kinner engine. Left: during the winter of 1929, the Gee Bee—pictured at the Springfield (MA) Airport—was equipped with skis.

right up to downed aircraft so he could work on them. His business prospered, and soon, all of his brothers were working with him. Zantford gained much experience in aircraft repair and felt that many things could be improved. He decided to design his own aircraft with a superior airframe and extra features that would make it less prone to damage and easier and safer to fly.

The new airplane had side-by-side seating, so the instructor could communicate easily with the student. The landing gear was designed so that it wouldn't damage the main fuselage structure if it collapsed during a hard landing. Zantford also developed a control-stick assembly that hung down

It first flew on May 2, 1929, and the flight was a big success; the new creation handled beautifully. They called it a "Gee Bee"—a name derived from the initials of their company.

Nine Gee Bee biplanes were produced—eight production aircraft and the prototype (3086). The Model-A, which brought the Granville brothers into the aircraft design business, was one of the most important aircraft of its time. In 1931, only two years after the Model-A's first flight, the first Gee Bee race plane—the Model-Z Sportster—became the first land plane ever to record a speed in excess of 300mph. A year later, Jimmy Doolittle flew the brothers' 1932 R-1 model and set several world records.



Front-end planking under way. Planking also goes between the top five stringers to make it easier to attach the headrests after the fuselage has been covered.

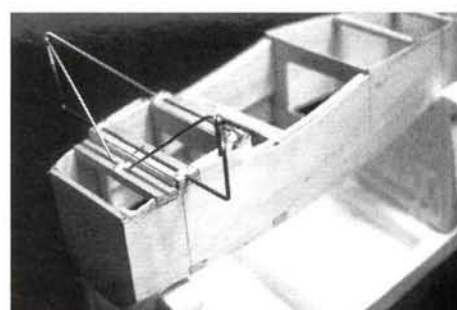
Left: designer Henry Haffke poses with his Gee Bee Model-A at the 2003 Rhinebeck jamboree.

the transmitter. I flew it around for a few laps, and then I tried a loop and found that it does better loops than any model I have ever flown. We knew the stabilizer needed a little positive incidence, and we discussed what else might make the model even better. We felt that enlarging the tail surfaces a little would be an improvement, as would adding a little engine down-thrust. After we had made those adjustments, its flight performance was perfect; there wasn't any need for us to

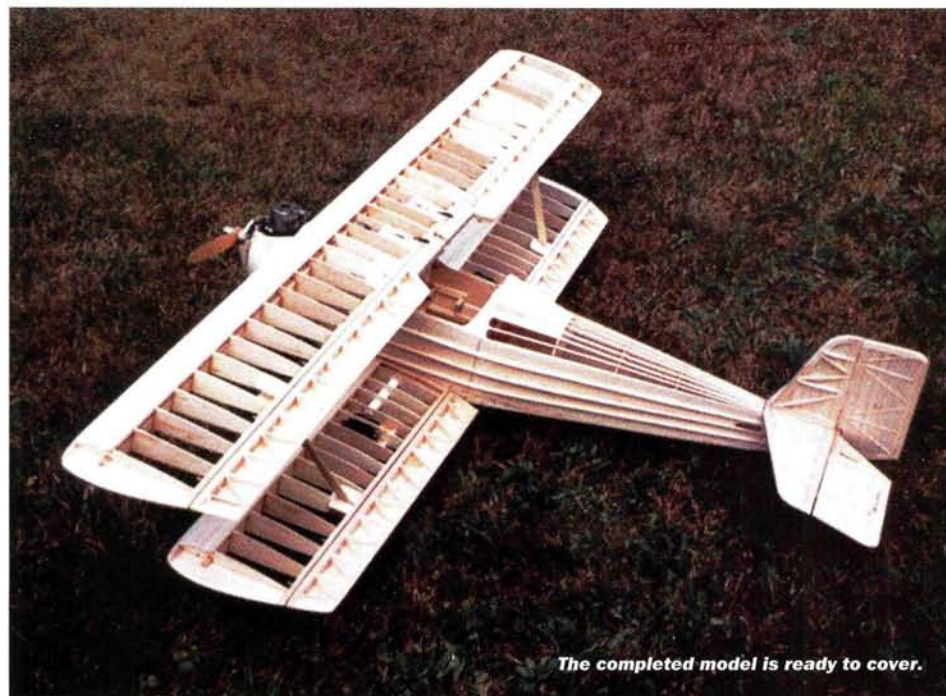
make trim adjustments anywhere. The plans show these improvements.

CONCLUSION

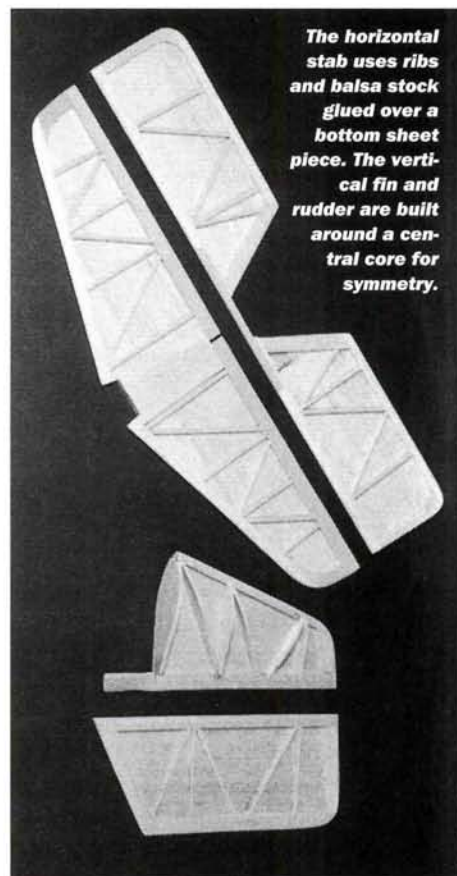
So the modeling world is no longer devoid of this historically important and colorful biplane. No. 3086—the first Gee Bee aircraft—inspired the Granville brothers to get into the airplane-building business! The last production model of this plane is the sole survivor and is now on display in the New England Air Museum in Windsor Locks, CT.



The landing-gear wires have been attached to the blocks and soldered together.



The completed model is ready to cover.



The horizontal stab uses ribs and balsa stock glued over a bottom sheet piece. The vertical fin and rudder are built around a central core for symmetry.

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MULTIPLEX

ROYAL EVO 9

RADIO

Digital programming your way

by John Reid

Ever since Hitec RCD acquired the Multiplex Co. last year, modelers in the U.S. have greatly anticipated the release of the Royal Evo line of radios. Many of us have seen this line displayed at various trade shows and have waited patiently to get our hands on one. Well, the wait is over; the new (old) line of Royal Evos is at last available here, and I can tell you that it was worth the wait.

The first thing that you notice when you pick the radio up is how good it feels. The transmitter's weight, balance and ergonomic design are well suited to human hands. The Evo has deep finger grooves on the back that provide an excellent gripping area and ensure that the transmitter fits securely in your hands. All of the switches and control buttons are within easy reach, so you won't have to fumble with the transmitter while flying your plane. The data screen is adjustable, so you're able to see the screen at various angles, and the antenna is adjustable; you can angle it up even when the transmitter is lying flat. This radio is a great combination of form and function.

CUSTOMIZING THE ROYAL EVO

The Evo comes with a nicely done instruction manual, but some of the German-to-English translations may have you scratching your head. Although this presents a few stumbling blocks, the manual is concise and has many detailed instructions that will help guide you through your first programming efforts.



The transmitter's antenna can be angled up and to the left—nice for keeping it out of your field of vision.

One of the most unusual things about this radio's manual is that its first seven pages describe how to make adjustments inside the radio. This is something we are not used to seeing in the States—manufacturers giving us the go-ahead to open the back of the transmitter case. In fact, Multiplex makes it quite easy to get inside the transmitter; two sliding latches on the back permit easy access without your needing to find a screwdriver. The only tool that you'll need to make all of the adjustments inside the case is a TORX screwdriver (size T6), and you'll find one in a clip below the antenna well.

The first thing that you'll want to do inside the transmitter is set up the throttle stick from spring centering to a ratchet or friction operation. Depending on the mode in which you fly, either stick can become the ratchet throttle stick. You can also swivel the stick units so that the sticks' movements

conform to the natural movement of your thumbs. To match your hand size, adjust and/or replace the stick tops with one of the three extra tops of various lengths that are included. One top comes with buttons that can be hooked up inside the transmitter to add two more switches that can be assigned auxiliary functions. This gives the pilot a quick, safe way to operate specific functions without having to let go of the stick. You can also install a Radio Frequency module, if you want to upgrade to an HFM-4 module. When you've finished customizing the radio to suit your flying style, you'll be ready to step into Multiplex's world of computer programming.

PROGRAMMING AND OPERATING THE TRANSMITTER

There's an old saying: be careful what you wish for because you just might get it. For years, fliers have longed for a



No matter the radio's position, it's easy to view the information on the large, adjustable data screen. This function is especially handy when the radio is in a transmitter tray.



The keypad area has 11 buttons in two rows. All of the data entry is done here. The top six buttons provide fast, direct access to the six main menus. The bottom five buttons are used to enter programming procedures. All the buttons (except "Enter") have double functions for entering text.

radio that can "do it all," and the Evo comes closer to satisfying this wish than any other radio I've seen. The drawback to its flexibility, however, is its steep learning curve. Some will pick it up very fast; others will take longer, but the main thing to remember is that you will get it, and once you do—wow! This radio does so much that it could be the last one you'll ever need.

On entering the world of Multiplex programming, you must first learn a few new terms—such as widgets, controls, channels and mixers—that are

specific to Royal Evo radios. Some of these words are used on other radio setups, but in the Multiplex community, they have different meanings. Widgets are sticks, switches, buttons and sliders on the radio. The controls are the function of the widgets. Mixers are a list of control inputs (up to five) that each provides a signal to a specific servo.

The Evo follows an unusual programming sequence; you first assign a servo to a mixer, and this mixer is then assigned to a control, which is then assigned to a widget. As you can see by

SPECIFICATIONS

PRODUCT: Royal Evo 9

MANUFACTURER: Multiplex USA

DISTRIBUTOR: Hitec RCD

TYPE: 9-channel computer radio
w/20-model memory

TRANSMITTER: 9-channel, dual stick
(modes 1 to 4)

RECEIVER: mini DS-IPD dual-conversion
9-channel (2.5x1.5x0.8 in.; 1.23 oz.)

SERVOS: none included; any brand
may be used

ACCESSORIES: dual-output battery
charger, switch harness, three control
sticks and operator's manual

PRICE: \$475 to \$850 (depending on
transmitter and flight pack; review
radio—\$587)

FEATURES: 9-channel control; 20-
model memory (the Evo 12 can hold
36 models in its memory); 14 pro-
grammable mixers; any switch, button,
slider, or control may be assigned to
any servo channel; three different
timers; adjustable high-definition
graphic data screen; adjustable stick
gimbals; data transfer, model-naming;
and a 112-page manual.

COMMENTS: once you've mastered its
programming, the Evo 9 will do just
about anything you would ever want it
to do. This could be the last radio you'll
ever need.

HITS

- 20-model memory.
- 14 programmable mixers that can
have five different inputs.
- Extremely versatile; offers the ability
to assign any control to any switch,
slider, button, or stick gimbal.
- Synthesized systems available.
- Digi-Adjuster knobs permit easy
alteration of any numeric values that
can be input.

MISSES

- Expo settings are the same in all
flight modes.
- Steep learning curve.



The Royal Evo 9 comes with three different pairs of stick tops, including the long pair on the left and the short pair on the right. The long stick tops have two additional button functions for a wide variety of programming functions.



The Royal Evo 9 has a nice, easy-to-reach layout of all the switches and sliders. The 3D Digi-Adjusters (at the top right and left of the transmitter) can be used during programming for quick data entry. They can also be assigned to a wide variety of parameters, which can then be used to adjust those settings while the model is flying.

this assignment sequence, the widgets are the last things to be assigned in the radio programming. What this means is that when I first pulled the radio out of the box, none of the widgets did anything; I had to assign all of the controls to the widgets. This was a major hurdle for me to overcome, but following the Royal Evo tutorial by James Drulia was time well spent on my journey to Royal Evo enlightenment. Take the time to download the tutorial from the Multiplex website, and read it before you set up a plane on the Royal Evo; you'll be glad you did.

WHAT CAN THE ROYAL EVO 9 DO?

Once you understand the Royal Evo's unique programming requirements, you'll be rewarded with a nearly infinite variety of ways to set up your plane or helicopter. Much of the manual is devoted to setting up helicopters, and chopper jockeys will definitely want to check into this radio. I made a number of plane setups using the Royal Evo; the following is just a sample of what you can do with it.

You can store up to 20 (36 on the Evo 12-channel) models in memory, and you can program up to four modes for each. These modes allow the pilot to assign a set of parameters, such as servo travel and other trim settings, to a particular widget on the transmitter. These assignments permit the pilot to select a particular flying setup with a simple flick or push of a widget; you can go into a 3D-flying mode with higher throw rates or into a landing mode with a mix that couples the throttle control with flaps and elevator. Setting up various flight modes greatly reduces a



The sliding latches provide an easy way to open the back of the transmitter so you can access the battery, RF module and adjustment screws for stick tension and function. The stick units can be swiveled in their mounting from the inside to align them with your hand's natural movements.

pilot's workload so he can concentrate on flying the plane.

The Royal Evo 9 offers 14 freely definable mixers that you can create depending on your flying needs and model type. Each mixer can have five different mixer inputs (controls) assigned to it. These freely definable mixers allow the pilot to choose from a vast array of mixing options.

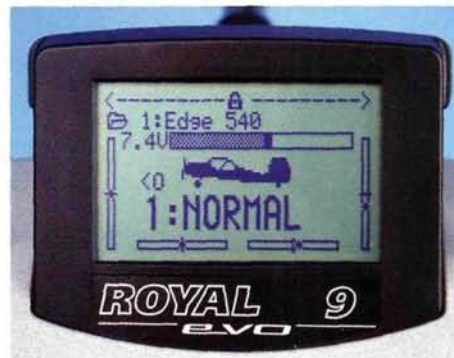
The Digi-Adjusters are, in my opinion, among the coolest controls on the Royal Evo. These two knobs on the upper right and left of the transmitter body can be



From the setup screen, you can configure the transmitter, define mixers, assign control to different switches, set up the training mode and define users.



This is the sub-menu under the control main screen. From this screen, you can adjust the aileron trim, step (how far the trim moves the control surfaces for each beep), dual rates, servo travel and expo.



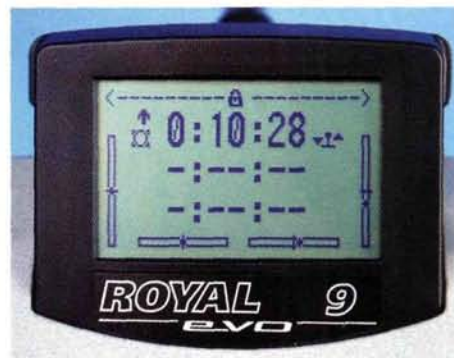
This is the flight-phase display—one of four status displays. From here, you can quickly tell the status of the 3D Digi-Adjusters, current model memory, current battery voltage, switch used to change flight mode, current flight mode and current trim positions.



The memory screen allows you to select the model you want to fly, copy one model's data, erase a model's data, select a different flight phase, change a model's properties and create a new model.



The mixer screen displays the current mixers incorporated in the active model.



The timer status displays only the timers to which switches have been assigned. You can program three different timers for each plane, a slot timer, a sun timer and an interval timer.

used to alter just about any numeric value that's input. Let's say, for example, that you want to adjust the high end of the dual rates. One Digi-Adjuster is set to the elevator while the other is set to the ailerons (or rudder). Fly your plane and switch to high rates; dial in as much throw as your plane needs by turning the Digi-Adjuster without ever taking your eyes off the plane. When you are satisfied with the feel of the high rates, press down the Digi-Adjuster to lock in the values. After you've landed the plane, just erase the Digi-Adjuster assignment for the parameter, and that's it. You now have your dual rates set just the way you want them, and you made all the adjustments during a single flight.

The Royal Evo 9 has three timing modes, and each fulfills a different need. The sum timer allows the pilot to start and stop the timer with an assigned widget. The timer continuously sums up how long the widget has been on. This mode is great for monitoring how much running time has accumulated on the engine—an

excellent piece of information when you develop an engine-maintenance schedule. The slot timer can be used to set off an alarm after a certain amount of time; it can be activated by the throttle control to warn of low fuel, e.g., after 10 minutes of flight. The interval timer sounds an alarm at intervals and continues to do so for as long as you like.

The Royal Evo 9 can calibrate each servo so you can center and align them at different points. This means that you can match two servos on the same control surface to operate in sync and eliminate the excessive battery drain caused by servo-stalling.

The only drawback I found in the Royal Evo's programming was in setting each servo's exponential. Expo can be set from +100 to -100 percent, and this range gives the pilot complete control of how the plane feels while it's flying. Once the expo is set for a particular channel, however, it stays that way throughout all four flight modes. A pilot might want 10-percent expo for normal flight mode and 30-percent expo for 3D, but you can't do

this with the Royal Evo's basic programming structure. The good news is that a PC interface cable (available for \$40) allows you to download the Royal Evo DataManager and install any future program patches.

CONCLUSION

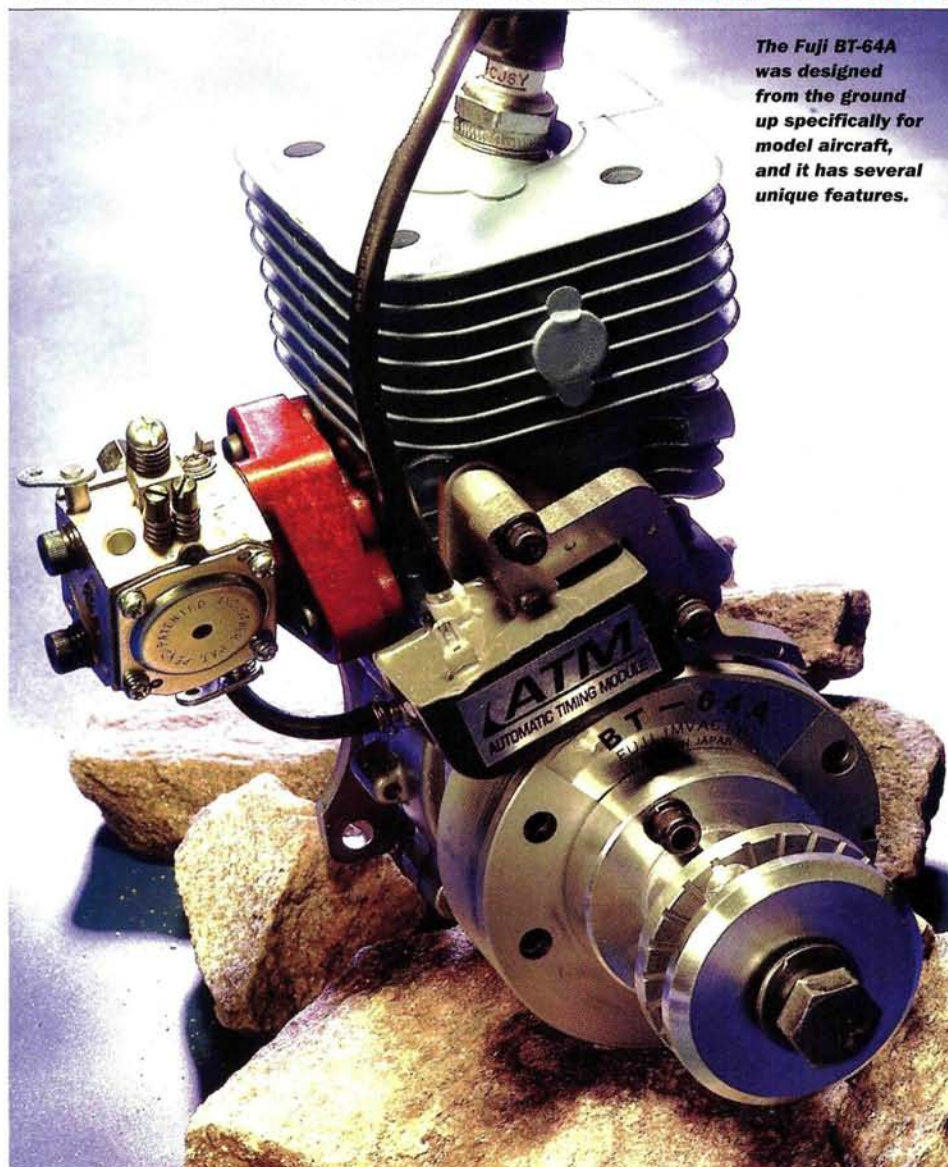
I am thoroughly pleased with the Royal Evo 9 radio system; it can do just about anything, and my descriptions only scratched the surface of its capabilities. The Royal Evo 9- and 12-channel radios are also available with synthesized transmitters and receivers that allow you to set the frequency on which you want to fly—great for crowded fields. This is one product that lives up to its pre-release publicity. If you want a radio system that allows you to program it exactly the way you want to, the Royal Evo 9 is a great choice and an excellent value. ✦

Multiplex Co.; distributed by Hitec RCD Inc. (858) 748-6948; hitecrad.com.

FUJI BT-64A

THIS BIG GAS BURNER IS FOR **SERIOUS RC POWER**

by Bruce Smith



The Fuji BT-64A was designed from the ground up specifically for model aircraft, and it has several unique features.

specifications

ENGINE: BT-64A

MANUFACTURER: Fuji

DISTRIBUTOR: Great Planes Model Distributors Co.

LENGTH OVERALL: 6.75 in. from rear shaft to prop flange

LENGTH: 4.33 in. from back of mount to front of prop flange

WIDTH OVERALL: 7.5 in., including carb and muffler

HEIGHT OVERALL: 8.5 in. from spark plug to engine mount

HEIGHT: 5 in. from crank to top of cylinder head

DISPLACEMENT: 3.85ci (63.1cc)

PRACTICAL RPM RANGE: 1,300 to 7,200

HORSEPOWER: 5.7 @ 9,000rpm

WEIGHT W/MUFFLER: 5.6 lb.

PROP BOLT: M10x1.25; 50mm long

MAGNETO GAP: 0.5mm (0.020 in.)

PRICE: \$429.99

FEATURES: the Fuji BT-64A comes with a butterfly-choke-valve-equipped Walbro carburetor, a resistor-type Champion RCJ6Y spark plug, Automatic Timing Module (ATM) ignition, heat-resistant painted cylinder heads, a chrome-plated sleeve, 4 ball bearings (2 on the crankshaft and 2 on the conrod), a canister muffler and attachment bolts and a two-piece engine mount.

COMMENTS: the Fuji BT-64A is designed from the ground up as a powerful RC aircraft engine—not an industrial engine converted to RC use. Its carb is positioned so a direct-linkage throttle setup can be used for a faster, more accurate throttle response. The engine comes factory tuned, and it has one of the best instruction manuals I've seen. Maximum prop thrust was 30 pounds! The recommended gas/oil ratio is 40:1.

In the world of giant-scale RC model aircraft, the gasoline 2-stroke engine in the 60cc displacement class has reigned supreme over all other engine sizes and varieties. Historically, this class of engine has powered warbirds weighing up to 35 pounds and aerobatic aircraft up to 96 inches in span (give or take an inch). Why the popularity? I think that price creates the line between those who want to grow only as far as their budgets (and nerves) will allow and those for whom money (and aircraft size and complexity) isn't a consideration. I'm the former kind of modeler; I've found that 60cc gas engines are an extraordinarily good value and highly versatile. It's no accident that there's a plethora of aircraft kits, ARFs and plans for aircraft that match these engines.

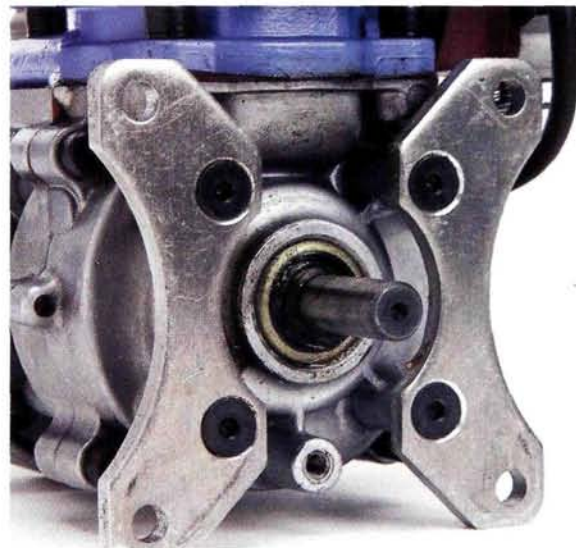
The Fuji BT-64A spans the divide between the two types of modeler I describe. As I discovered when I tested it for this review, it's potent, affordable, well-built and easy to operate.

ABOUT THE ENGINE

The BT-64A was designed by entrepreneur/engineer and avid RC modeler Seiji Tanabe specifically for model aircraft. The entire Fuji gasoline engine line benefits from the same state-of-the-art technology and has a few value-added features that I'll



The Walbro carb has an RC throttle-arm design—not like the industrial setup on other gas engines. Notice the molded separator block that supports the carb.



The two engine-mounting plates are made of thick aluminum and can easily be used with vibration-isolation mount bolts.

get into shortly. If you aren't familiar with the brand name Fuji as a gas-engine manufacturer, just think back to the Byron Originals' Mustang 50 gas engine; yes, that was a Fuji! I have several RC buddies who still own these engines and report that they run as well now as on the day they bought them.

FEATURES

- Engine mount
- ATM module
- CNC machining
- True chrome plating in the cylinder bore
- 2-ball-bearing-supported crankshaft
- 2-needle-bearing piston connecting rod
- Walbro HDA-211 pumper carburetor with RC linkage
- Prop-extension hub of standard length (40mm)
- Heat-resistant paint on cylinder head
- Dynamically balanced crankshaft
- Flywheel and prop hubs
- Large-volume exhaust
- Champion RCJ6Y resistor spark plug (plug wrench included)
- 3-year warranty

OPTIONAL PARTS

- Bolt-on electric starter
- Spring starter
- "Long" (60mm) prop-extension hub
- Spinner adapter bolt for use with Tru-Turn spinners

While the BT-64A comes with an exhaust for right-side-up or inverted use, Bisson Custom Mufflers offers excellent, high-quality alternatives for the Fuji line, and the BT-64A is no exception. For my performance tests, I used the standard Fuji exhaust and the Bisson inverted Pitts-style (note that

Bisson also offers a vertical exhaust for installation in narrow cowl). Last, Great Planes offers a modestly priced engine kill switch that has both toggle and microswitches in a single wiring harness for external or servo-activated engine kill. The manual recommends the use of an external switch for additional safety, regardless of whether you use the servo-activated microswitch inside the aircraft.

AUTOMATIC TIMING MODULE

Key to the Fuji engine line is the Automatic Timing Module (ATM)—a brilliant solution to the starting difficulties that often plague capacitor-discharge-ignition (CDI), or "magneto," engines. To illustrate: a magneto engine typically has its timing permanently set at the top of the rpm power range for optimum performance; this leaves the low end with significant spark advance. For many modelers, hand-flipping the prop proves to be a lesson in frustration and occasionally involves prop kick (that hurts!). The brilliance of Fuji's ATM ignition lies in its module's timing-advance control; it eliminates the traditional low-end early spark advance. When they're being started, Fuji gassers behave like electronic-ignition engines: the spark advance is reduced to allow safe, injury-free hand-starting. From idle to top end, the timing advances linearly as rpm increase, and this ensures optimum timing through the entire powerband.

SOME ASSEMBLY REQUIRED

You have to attach the exhaust, the prop hub, the throttle linkage and the kill switch (you supply your own linkage and switch). A metric hex wrench is provided. The throttle linkage is your choice; I like

ball-end components and used Du-Bro 4-40 ball-link hardware. The carburetor's throttle arm has a hole that is large enough to accommodate most other linkage options, so you can use your favorite setup; as with any ignition engine, use a non-metal pushrod for throttle activation.

THE MANUAL

The Fuji manual is the best I've yet encountered! While other manufacturers fail to inform users about throttle-pushrod material, the distance between the receiver switch and the kill switch, and how to install the kill switch, the BT-64A's manual covers all these very nicely. It also has a great simple guide to tuning adjustments and troubleshooting—even instructions for easier starting. The BT-64A offers three choices for starting: hand-flip, spring-start and electric starter; the manual discusses all of them clearly.

Diagrams for the correct prop/flywheel magnet orientation are clear and well detailed, so no one should misunderstand this important relationship. The Fuji manual also covers safety precautions—always crucial aspects of our hobby.

PROPS AND LUBES

The manual recommends the use of a 22x10 wooden or carbon or 22x12 carbon prop. To obtain a clear picture of the Fuji's torque curve, I selected wooden props ranging from 22x10 through 24x10 in a variety of blade styles. I balanced all the test props—absolutely mandatory! I give the weight of every prop I used.

The manual recommends that you use a high-grade synthetic 2-cycle oil, mixed at a fuel/oil ratio of 25:1, for a one-hour break-in; then you should decrease the oil content to a ratio of 40:1.

Fuji BT-64A prop & muffler comparisons

TEST CONDITIONS

Temperature: 45 deg. F
Humidity: 74%

Barometer: 29.95

Fuel: 92 octane/25:1 Amsoil synthetic oil for break-in (1 gal. @ 2 hrs.); 92 octane/40:1 Klotz synthetic for performance tests

SERIES 1.

Standard Fuji BT-64A canister muffler; 1 exit; 1 1/16-in. i.d.

| | Top Flite PowerPoint | | | | APC | | | Zinger | Pro-Zinger | | |
|--------------|----------------------|-------|-------|-------|-------|-------|-------|--------|------------|-------|-------|
| Prop | 22x6/10 | 22x10 | 24x8 | 24x10 | 22x10 | 22x12 | 24x10 | 22x12 | 22x10 | 24x8 | 24x10 |
| dB | 102 | 100 | 101 | 100 | 104 | 103 | 101 | 101 | 103 | 102 | 100 |
| Rpm | 6,300 | 6,150 | 5,760 | 5,500 | 6,990 | 6,540 | 6,360 | 6,050 | 6,990 | 6,500 | 5,800 |
| Thrust (lb.) | 28 | 24 | 26 | 26 | 26 | 25 | 28.5 | 26 | 28 | 29** | 25 |
| Weight (oz.) | 3.5 | 3.8 | 4.2 | 4.2 | 8.2 | 8.3 | 10.3 | 3.6 | 3.6 | 4.9 | 4.3 |

SERIES 2.

Bisson Pitts-style muffler; 2 exits; 1 3/32-in. i.d.

| | Top Flite PowerPoint | | | APC | | | Zinger | Pro-Zinger | | |
|--------------|----------------------|-------|-------|-------|-------|--------|--------|------------|-------|-------|
| Prop | 22x6/10 | 22x10 | 24x8 | 22x10 | 22x12 | 24x10 | 22x12 | 22x10 | 24x8 | 24x10 |
| dB | 99 | 96 | 98 | 98 | 97 | 95 | 96 | 99 | 96 | 95 |
| Rpm | 6,350 | 5,700 | 5,600 | 6,750 | 6,450 | 6,180 | 5,850 | 7,080 | 6,210 | 5,700 |
| Thrust (lb.) | 26 | 22.5 | 24 | 24 | 24 | 27.5** | 23 | 27 | 26 | 23.5 |
| Weight (oz.) | 3.5 | 3.8 | 4.2 | 8.2 | 8.3 | 10.3 | 3.6 | 3.6 | 4.9 | 4.3 |

SERIES 3.

Open exhaust port; no muffler; 26.3x14mm

| | TF PR-PT* | APC | Pro-Zinger |
|--------------|-----------|-------|------------|
| Prop | 24x10 | 24x10 | 24x8 |
| dB | 105 | 109 | 105 |
| Rpm | 5,850 | 6,990 | 6,500 |
| Thrust (lb.) | 28 | 30** | 29.75 |
| Weight (oz.) | 4.2 | 10.3 | 4.9 |

OVERALL BEST COMBO—DB AND THRUST
Modified Bisson Pitts-style muffler;
2 exits trimmed to 1/2-in. i.d.

| | APC |
|--------------|-------|
| Prop | 24x10 |
| Rpm | 6,330 |
| db | 96 |
| Thrust (lb.) | 28.5 |

Comments: the performance data includes propeller make, model, diameter and pitch and weight, muffler (if used) and dB recorded at 3 meters, the rpm, and the thrust measured by what the engine pulls in pounds.

Series 1 compares performance data using the supplied Fuji muffler.

Series 2 takes readings from all of the propellers using the Bisson Pitts-style muffler.

Series 3 reveals what the best performing propellers running open port (no muffler) generate as a final evaluation of all the criteria.

*TF PR-PT = Top Flite PowerPoint prop

**Thrust = peak thrust for each test series

well for me. Throttle transition was crisp, and the torque curve between 6,100 and 7,000rpm was pretty flat when turning a variety of props. Even turning the 10-ounce APC 24x10 prop, throttle transition was very good.

The performance tables show the readings obtained with each of the props I used. Remember that an engine responds differently to variations in prop pitch and diameter and particularly to prop profiles, i.e., the surface areas that do the work. APC props' profiles are significantly smaller than those of a standard Zinger or Top Flite PowerPoint prop. As a result, the APCs run faster than they do, and in this case, they delivered more thrust as well. Some engines develop more torque at lower rpm; others require higher rpm for better performance. All of these props are great performers; it's just a matter of finding the right one for your particular application. That's why I

test to find out which ones offer the highest thrust at the most acceptable decibel readings. Comparing rpm figures is not the only way to evaluate performance; they are a byproduct and will always increase engine noise levels as they increase.

With regard to decibel (dB) readings, the FAI (Fédération Aéronautique Internationale) assesses dB levels at 3 meters from the prop with the

The Automatic Timing Module (ATM) makes the engine easier to start.

RUNNING THE ENGINE

I followed the steps given for priming and choking the Fuji 64, and it started easily, without a glitch. With the kill switch in the off position, flip the prop over—perhaps 10 to 20 times—until you see gas fill the line. Close the choke, move the kill switch to the “on” position and flip the prop until the engine pops. Then open the choke and set the throttle to just above idle, and flip the prop again until the engine starts. The test engine fired on the third flip right out of the box—pretty darn encouraging.

For break-in, I used a Top Flite PowerPoint 22x10 prop and a 25:1 ratio of Amsoil and high-octane gasoline fuel mix. Early tachometer readings were around 5,600rpm, but they increased steadily until leveling out at 5,700 by the end of the first gallon of fuel. This rpm number may seem a bit low, and I'll explain it just ahead.

The Fuji BT-64A is “factory-tuned” and ready to run; the manual includes the factory default settings in case you get lost when you tune the needle valves. The high-speed needle is very responsive; 1/8 turn made a noticeable difference to engine speed. The factory settings worked



powerplant running at full throttle. Decibel readings encompass all the noise generated by the engine, including exhaust note, prop noise, carburetor induction and airframe resonance. To lessen the overall influence of these factors, a number of steps can be taken, although the most effective is to use a quieter exhaust (which also tends to suppress performance). Reducing prop noise, some of which is generated by excessive tip speed, is most often accomplished by using a prop with a smaller diameter and a higher pitch; this may reduce your engine's optimum thrust. There isn't much you can do about induction noise, though popular opinion is that rear-induction engines are less noisy. Often overlooked is airframe noise. Engine vibration is transferred to the airframe, which, depending on its weight and construction, may actually amplify that vibration. Use soft, vibration-damping engine mounts or isolation mounts to reduce airframe noise.

The performance tables reveal that the standard Fuji exhaust provided with the engine was louder than some of our flying sites would allow. It's interesting that the BT-64A doesn't produce a significant increase in noise when it's completely uncorked—typically 5 to 8dB more. Performance is definitely enhanced with a less restrictive exhaust; with this engine, you will notice performance fall off when using the quieter, yet more restrictive Bisson Pitts exhaust. To improve the Bisson's performance, I trimmed off the ends of the downpipes to enlarge the tubes to 1/2 inch i.d.; then I took one reading with the prop that did best: the APC 24x10. The resulting 450rpm, 1dB increase and 1-pound increase in thrust is a significant performance improvement; the noise level is still a respectable 96dB—all accomplished with little effort.

In the end, the Fuji BT-64A test engine achieved the 30 pounds of thrust I had hoped it would, but not at a very "friendly" decibel level. With the stock exhaust delivering 29 pounds at 102dB with a Pro-Zinger or the Bisson/APC combination's 28 1/2 pounds at 96dB, I'm satisfied.

Happy flying! ✈

APC; distributed by Landing Products (530) 661-0399; apcprop.com.

Bisson Custom Mufflers (705) 389-1156; info@bissonmufflers.com.

Du-Bro Products (800) 848-9411; dubro.com.

Fuji; distributed by Great Planes; fujiengines.com.

Great Planes Model Distributors (217) 398-6300; (800) 682-8948; greatplanes.com.

Top Flite; distributed by Great Planes; top-flite.com.

Walbro; walbro.com.

Zinger; distributed by J&Z Products (310) 539-2313; zingerpropeller.com.

An inside look

For this review, I disassembled the BT-64A and evaluated it from the inside out. I found it easy to work on; the only unusual tool required was a gear puller to remove the flywheel.

For a CDI engine, the flywheel, ignition coil and associated bracket incur an obvious weight penalty, and there really isn't much that can be done about it. The flywheel positively engages the crankshaft with a tapered fit and a woodruff key. A hex nut and washers lock the unit into place. The engine has the innovative ATM module, whose size and weight are basically the same as the standard coils' on other CDI engines. The aluminum



The separated crankcase halves; notice the cleanly machined surfaces and overall high manufacturing quality.

mounting bracket suits the crankcase design, and mounting bosses are cast in the front half of the case—again, a little extra weight. The crankcase amounts only to the parts required to support the crankshaft and the one-piece cylinder jug. The ball-bearing races are press-fit into the case halves, the edges of which have been machined for a really clean, tight fit. One half has pins to align it with the other half. I think this is pretty cool. The parts fit together tightly and need only thin gaskets—no gasket goop. Each case half is finished with a grease seal that protects the bearing races and lubricates the crankshaft ends that protrude from the case.

The crankshaft is a very stout assembly; needle bearings support the conrod at both ends. Whereas other gas engines allow quite a bit of conrod travel at the piston wristpin, the BT-64A has thrust collars that limit lateral play—more evidence of the engineering expertise behind this design. The cast-aluminum piston has two piston rings that ensure a positive compression seal. The hardened wristpin is press-fit into the piston and held with two spring clips.

The BT-64A's cylinder bore is chrome-plated for durability, and the machine work and casting are clean and precise. The cylinder is painted with a heat-resistant paint that looks super.



The cylinder bore is chrome-plated. Notice the generous bypass porting.

An angled exhaust port on the cylinder looks reminiscent of the 3W50i. This curious departure from the norm isn't mentioned in Fuji literature, but Cactus Aviation claims that this angled port enhances power. I'm not making any claims here, just noting the difference. Induction parts include the Walbro HDA-211 carburetor and a cast phenolic adapter/heat-isolator block that uses threaded inserts for the cap-screws that hold the assembly together. The Walbro uses a diaphragm to create positive fuel-pump pressure without having to lose exhaust pressure; the main benefit of this is that the fuel tank can be farther from the firewall—preferably near or on the model's center of gravity. The angle of the carburetor is very well suited to typical aircraft throttle-linkage installations. While the carburetor angle is great, in my opinion, the carb's linkage arm is still too short. A longer arm would offer a more gradual throttle change with the servo's linear movement. For now, I'm happy that the throttle arm resembles an aircraft control arm and not the industrial configuration Walbro usually uses.



The molded phenolic carb-adapter block isolates the carb from excessive engine heat and ensures more consistent performance.

The crankshaft assembly with the main bearings and grease seals. This design limits the conrod's side motion.



The crankshaft assembly with the main bearings and grease seals. This design limits the conrod's side motion.

The stout piston has a two-ring design; also shown are the wristpin and the retainer clips.



The stout piston has a two-ring design; also shown are the wristpin and the retainer clips.

WEIGHT DETAILS

IGNITION PARTS & BRACKET: 8.3 oz.

FLYWHEEL, KEY, NUT & WASHERS: 10.7 oz.

CRANKCASE & CAPSCREWS (8): 9.8 oz.

CRANKSHAFT ASSEMBLY, BEARINGS & SEALS: 19.4 oz.

PISTON, WRISTPIN & RETAINERS: 3.2 oz.

CYLINDER JUG: 16.3 oz.

WALBRO ADAPTER BLOCK & CAPSCREWS: 6.2 oz.

TOTAL: 73.9 oz. (4.61 lb.)



Classic Model Airplane News by Matt Boyd



... jets were coming into their own in full-size aviation. The June 1954 cover of *Model Airplane News* reflected that when it featured the graceful Handley Page Victor, a British jet bomber. The issue continued the jet theme with an in-depth look at Jetex rocket

50 years ago ...

motors—virtually the only motors of that type then available for model aircraft. Peter Chinn explained the details with a style that became familiar to *Model Airplane News* readers for decades to follow.

... “Radio Control News,” the column that was devoted to RC back when *Model Airplane News* covered everything from control-line to free flight, showed readers the new DMECO servo, a 1.5-ounce unit that produced a whopping 8+ ounces of torque. We noted that DMECO (short for deBolt Model Engineering Co.) was “going hog-wild for RC planes and accessories.” As usual, Hal deBolt was ahead of the crowd, blazing a trail that RC’ers have followed for more than 50 years. And he’s still at it—thanks, Pappy!

... just as it is today, Air Age was the source of all things model-related. The wealth of information was too large to fit in the magazine even back then, so we supplemented it with “how-to” books such as this one by *Model Airplane News* alumnus Charles H. Grant. Today, our range of titles is the most extensive in the modeling world; visit RCStore.com, and see for yourself.

... we celebrated our golden anniversary with a look back at some models that were already classics then. In a feature titled “Golden Oldies” we took a look at Sal Taibi’s 1941 Nationals-winning Pacer. We also scooped the annual WRAM Eastern

25 years ago ...

States Jamboree—a model show that senior tech editor Gerry Yarrish covers in this month’s “Thinking Big.”

... Hobby Lobby was making it big in RC—not with the excellent electrics

that they’re known for these days, but with items such as this *big* Evra 190 gas engine. The 1979 price wasn’t big, though: a 1.9ci gasser for less than \$100; it’s almost enough to forgive platform shoes, bell-bot-

toms and disco. Almost.

... Dick Sarpolus wrote about three profile-fuselage warbirds for $\frac{1}{2}$ A power that could be built from the same basic plan. In the years since, he has switched over to

electric, but he’s still doing 3-in-1 construction articles; check out the one in the July issue of our sister publication *Backyard Flyer*!



... Steven Stratt’s Dornier Zeppelin D.1 graced the cover of the June 1994 issue. Both because of the unusual subject and the exquisite detail of this competition-level WW I fighter, there was so much to highlight that we had to make it a two-parter!

... in his “RPM Readers’ Q&A,” Dave Gierke addressed topics such as prop slippage, operating temperatures and the pro’s and cons of tuned pipes. Dave still answers readers’ questions and offers engine insights several times a year in his “RPM” column. If you have a question about model airplane engines, chances are, Dave has the answer.

... Faye Stilley, master modeler, longtime contributor and author of several books on finishing techniques, gave us a look inside his “aircraft carrier”—the ultimate RC aircraft conveyance. “Modeled” after the classic sedan delivery vehicles of the ‘50s, Faye’s ride started as a Chevy Caprice wagon, but it sports several flying-field features, such as dual-alternator-fed batteries (for charging), a huge cargo area and numerous purpose-designed storage compartments. When you see it, you’ll know it’s one of a kind—just like Faye! ✚



10 years ago ...



Multimotor Projects Basic Wiring 102

If you haven't ever built a multi-engine model, I'm guessing it's because trying to get two or more engines running well and in sync with each other seems like more trouble than it's worth. With electric motors, it's time to rethink that opinion; electrics will always be in tune with one another as long as they are running. The number of twin-motor planes really stands out at large electric meets these days, and there are lots of tri-motor and four-motor planes, too. When I went to my first KRC meet (formerly the granddaddy of electric meets) in 1992, I decided I had to have some of that magic multimotor knowledge, but as you will see, there is no magic about it. And, as a bonus, multimotor models allow you to make great use of the ferrite and cobalt motors that you might have lying around if you have upgraded to brushless. For years, Keith Shaw flew his famous King Crimson on Leisure ferrite motors, and its performance was excellent. Put those older motors to good use by doing a multi.

I'll use a common 7-cell motor for my examples, and for clarity, I've eliminated the switch harness, and no BEC is used. Now that we have that straight, let's

assume that the motors require 7 volts (remember that in last month's column I said to use 1 volt per cell under load for simplicity?) and 25 amps, so that means a 7-cell pack in a series circuit for each motor. Here is a rule of thumb: if two motors are wired in series, each one "sees" half of the total voltage of the battery pack, and the pack "sees" the current demands of one motor.

Because of that, you'll need two 7-cell packs wired in series (effectively a 14-cell pack); otherwise, the motors would each get only 3.5 volts—half the voltage of a 7-cell pack. The system in Figure 1 has been wired that way. Notice that the positive wire goes from the positive output on the speed control to the positive brush on one motor. Then, a wire from the negative brush of that motor goes to the positive brush of the next motor, and last, a wire from the negative brush of the last motor returns to the speed control into the negative output connection. This shows that the two motors are wired in series and are connected to the battery pack through the ESC. Each motor will "see" half the 14-cell pack's voltage (7 volts), and the speed control and battery will "see" the current



draw of only one motor (25 amps). You need to be sure that the speed control will handle the voltage and current you'll be putting through it. Although that is pretty easy to do in this example, you can quickly surpass the capabilities of many controllers when using two big motors that may require 18 or 21 cells each.

WHEN TO USE PARALLEL

A series circuit is the most common system for twins, but there are plenty of times when you may not want to carry the weight of all those cells, as in the case of some Speed 400 multimotor projects. What to do? It isn't a problem because you can wire the system in parallel. Here's the rule of thumb for parallel circuits: when using parallel systems, each motor "sees" the voltage of the entire pack, and the pack and speed controller "see" the combined current draw of both motors.

Look at Figure 2 to see how to wire two 7-cell motors in parallel, and remember that you need only 7 cells because each motor will see the pack's total voltage. Notice that the positive wire from the speed control's positive output goes to both of the motor's positive brushes. The

negative side feeds both negative brushes, so each motor is actually wired to the controller instead of to each other. In this example, the motors and speed control see 7 volts from the battery pack, and the controller and pack see a combined total of 50 amps from the motors. The series circuit allows more duration, but in a Speed 400 plane where each motor draws only about 10 amps, parallel circuits work fine because current might be only 20 amps at full throttle in a twin-motor aircraft.

WHAT ABOUT FOUR MOTORS?

Now let's look at a four-engine plane with Speed 400s. The combined current in a parallel setup is only about 40 amps, and that falls well within the current limits for many speed controls. But there is another way to get lower current demands on the controller and battery pack by using a combination of series and parallel circuits in one system (Figure 3). Where's the advantage, you ask? As a one-series circuit, this setup would have 28 cells that pull only 10 amps. The batteries would use a lot of room, and the cells



would have to be very small; otherwise, they would weigh a ton. Wired in parallel, it would need only 7 cells, but the current would be back up to 40 amps; that much current would seriously limit duration.

So, the answer is to use a combination that takes advantage of the best of both systems. By wiring the motors in series pairs and then bringing them into a parallel connection with the controller and battery pack, you end up with half the cell count of a series-only system with only half the current of a parallel-only system. This may not seem necessary with smaller motors, such as the Speed 400, but with large, multi-motor systems that draw more current, this is a very workable solution to the problem of balancing current and cell count.

Imagine a giant-scale plane with four motors that require 16 cells each. To power it, a simple series system would require 64 batteries, and since each motor would draw approximately 25 amps, you would have to

Figure 1.
Basic series circuit

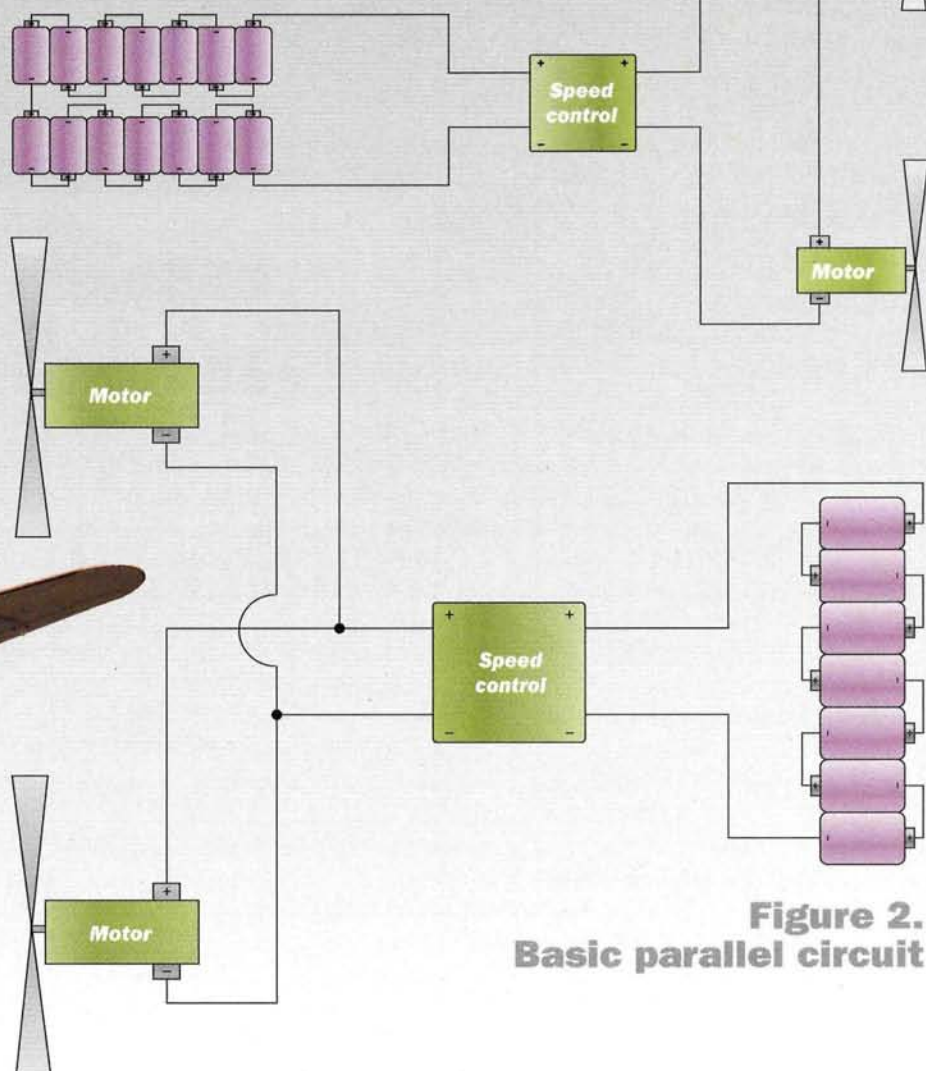


Figure 2.
Basic parallel circuit

use larger batteries, such as Sanyo 3000 cells. That's a ton of batteries. OK; maybe it's only 8 pounds or so, but that's still a lot of weight. If you use a parallel arrangement to reduce the weight, the setup requires only 16 cells, but it would draw about 100 amps, and that just isn't a workable solution. A series/parallel circuit would use 32 cells and have a 50A current draw; that's very manageable with readily available equipment. Sport fliers still tend to think of 50 amps as a lot, but remember, this full-throttle current level is typically seen only on takeoff; the rest of the flight will be at reduced throttle settings.

You can make these four-motor setups even more reliable by wiring the two out-board motors in one series, the inboard motors in another, and then use a fuse to isolate each series from the whole circuit in case of a malfunction. I admit I haven't ever experienced one motor failing in flight because of

a thrown brush holder, open comm, etc., but by wiring them this way, there would still be a motor on each side of the plane to help you nurse it back home and avoid asymmetrical thrust problems.

INDEPENDENT CIRCUITS

OK; what if we decided that the 50 amps are still too much, but the weight of 64 cells really isn't a problem in the super-giant-scale transport plane? To begin with, I haven't found a controller that is rated to handle 64 cells because of the liability issues for manufacturers. This is a serious amount of voltage, but there is a way around it.

Obviously, this plane is a very large project that requires alternative thinking. Why can't we just put two motors on one circuit and two others on an independent circuit? By setting this up as a dual-series system (see Figure 4), you can avoid the problems of

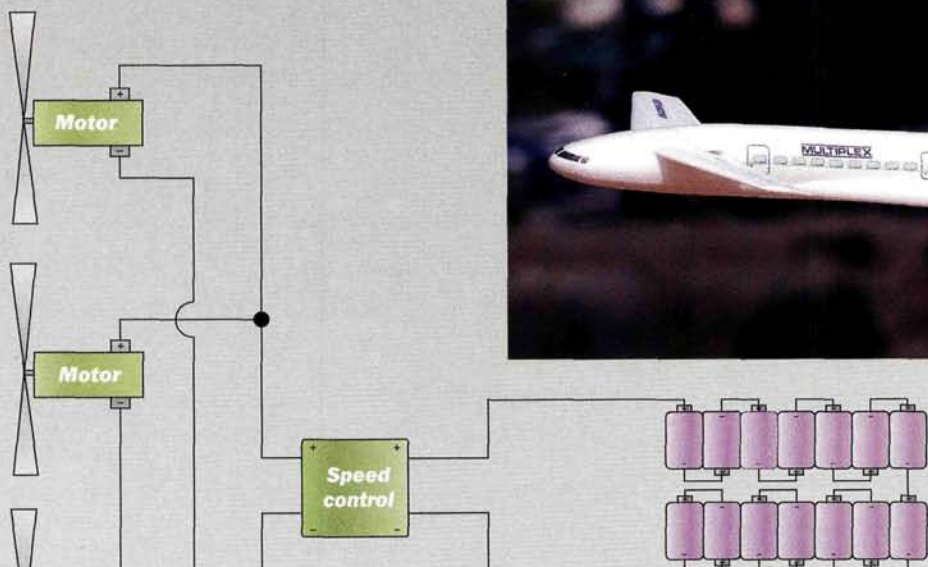


Figure 3. Series/parallel combination circuit

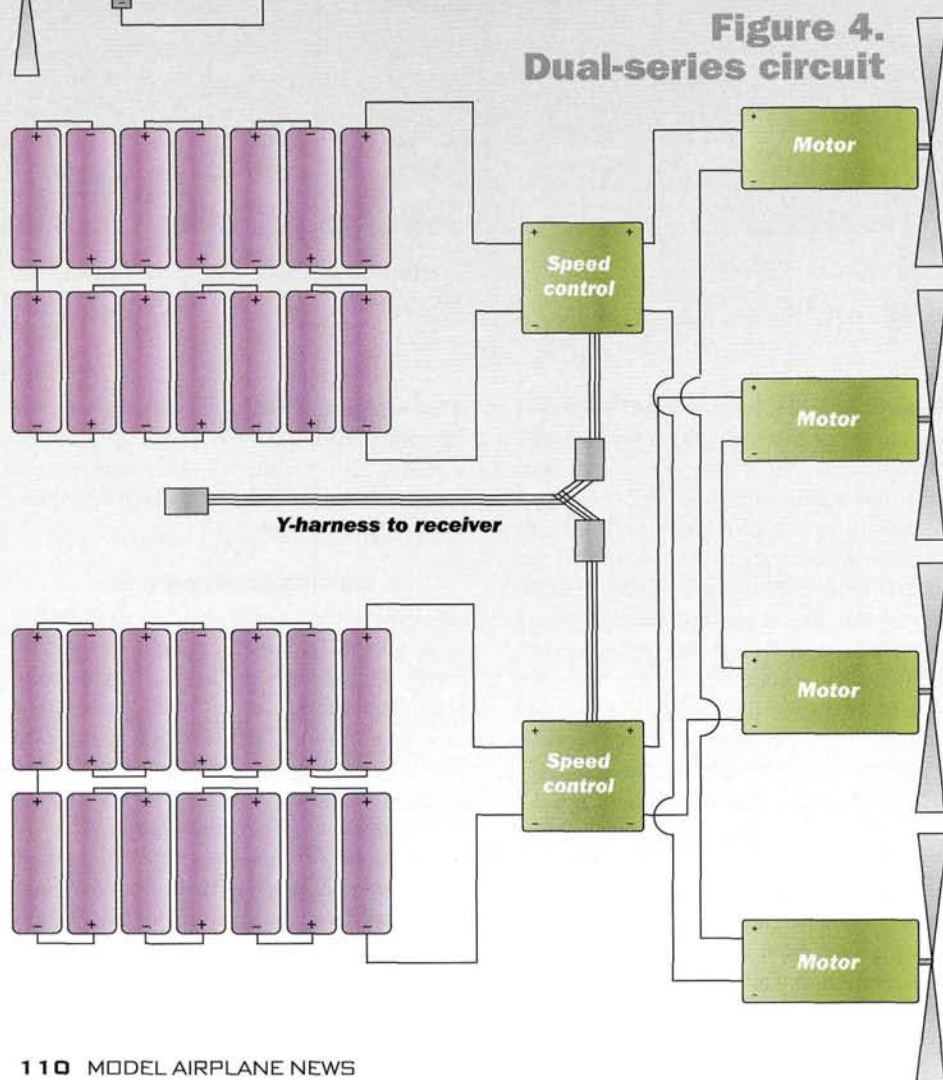
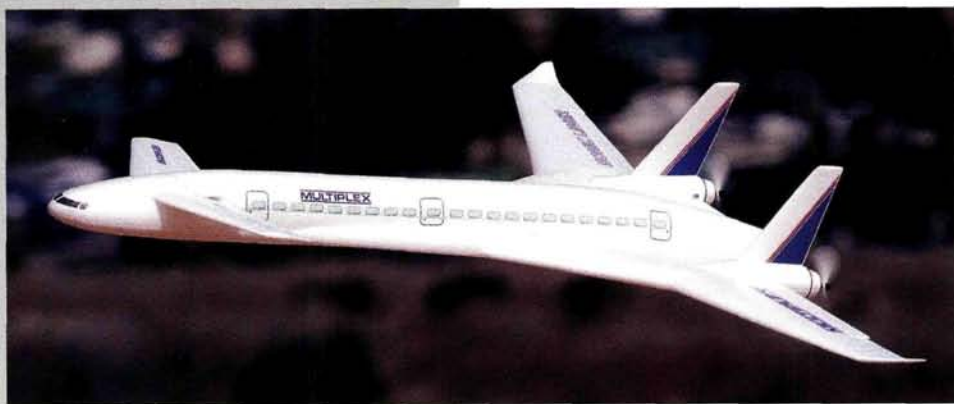


Figure 4. Dual-series circuit



high voltage and high current found in the previous example. In this setup, each circuit consists of two motors, 32 cells and a speed control. With two independent series circuits, you can use a "Y" cord to connect the two speed controls to the receiver. Once again, I've depicted them driving a



motor on each side of the aircraft so you'll never have those nasty asymmetrical thrust problems if there's a failure.

WHAT ABOUT BRUSHLESS?

Brushless motors? No problem—sort of. A cop-out answer, I know, but there are some caveats that go with using brushless motor systems. If you use a system with Hall sensors, there must be a controller for each motor; it's essentially a separate system for each motor. But with the advent of sensorless controllers and motors, the setup should be the same as our brushed systems, right? Well, yes—but only some of the time. The jury is still out on whether the available systems work that way; some do, and others don't. Although the technology is getting better, not all controllers sync the motors properly when they are started. Even within a brand, the results will vary when you use one sensorless controller for multiple motors. My recommendation is to check with the manufacturer before trying it. Check the online forums and find out which systems seem to be working the best before you spend any hard-earned cash. ✦

AstroFlight (310) 821-6242; astroflight.com.

Graupner; distributed by Hobby Lobby Intl. (615) 373-1444; hobbylobby.com.

Hobby Hangar (321) 727-8227; hobbyhangar.com.

HVP-Modell; hvp-modell.cz/.

SR Batteries showed off this great-looking 1/4-scale Fokker E-I Eindecker! It's set up for either a Zenoah G-26 or an electric power system.



What's new for giant-scale

Every February, like clockwork, thousands of RC modelers from the New England area head to White Plains, NY. As predictable as the changing of the seasons, the Westchester Radio Aero Modelers (WRAM) Show signals to many snowbound modelers that the end of winter is close at hand. What better way to enter spring than by checking out all the new products and models on display? For giant-scale lovers like me, it's a breath of fresh air, and it starts me thinking about the new flying season that's only a few weeks away. Let's look at some of the neat giant-scale stuff I discovered at the 36th annual WRAM Show.

FOKKER EINDECKER

Designed by SR Batteries owner Larry Sribnick and giant-scale warbird aficionado Sal Calvagna, the new 1/4-scale Fokker E-I Eindecker kit from SR Batteries, priced at \$299.95, was a show favorite! Using balsa and ply construction, the kit has carbon-fiber parts for strength and weight savings, and it can be adapted for electric or gas power. Also included are highly detailed, full-size CAD plans, laser-cut wood parts, a spun-aluminum engine cowl, prebent music-wire landing-gear parts and carbon-fiber-tube wing spars and leading edges. A laser-cut assembly jig is included to help you properly space the ribs. The Eindecker has ailerons and a full flying rudder that pivots on a composite tube assembly—no hinging required! The tailskid and main landing gear are shock absorbing, and the firewall comes with engine-mounting

bolts, fuel line and throttle pushrod holes that are laser cut for the popular Zenoah G-26 gas engine. The due date for this beauty is April, so keep an eye open; it's sure to be very popular with the dawn-patrol set!

35-PERCENT PITTS MODEL 12

Designed by Bob Trueworthy, the new 35-percent Pitts Model 12 is sure to be another popular choice for the aerobatic biplane crowd. It has a 93-inch top wingspan and an 88-inch bottom span and weighs 35 to 40 pounds. Designed to use up to a big, 150cc twin-cylinder engine, the 35-percent model is an attractive and slightly reduced version of Bob's popular 41-percent-scale version (108-inch span). Full-size CAD plans, a fiberglass cowl and pants, molded canopy, aluminum landing gear, cabanes and a laser-cut short kit are available for \$590. If you are into really big biplanes, Bob has you covered! Check out his website at bigairplanes.com.



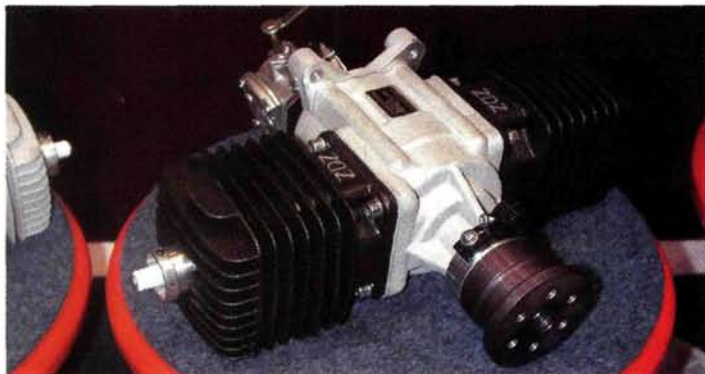
Here's a close-up of the Eindecker wing construction.

ZDZ 160 B2 CHAMPION

Mike Dooley from RC Showcase clued me in on the new ZDZ 160 B2 Champion. A hopped-up version of the popular 160 B2 RV engine, the Champion is a real powerhouse! Upgrades include: a new, lighter hub and prop pressure plate; a new Tillotson carburetor for better fuel delivery; a lighter titanium central prop-bolt assembly; a new rotary-induction design; black cylinders (which look great and



Here is the impressive 41-percent-scale Pitts Model 12 from Bigairplanes. A new 35-percent-scale version is in the works.



If you need serious power, check out the new ZDZ 160 B2 Champion from RC Showcase. It's an upgrade from the popular 160 B2 RV engine.

help dissipate heat); and factory-installed, adjustable ball links for choke and throttle linkage. Priced at \$1,375, the ZDZ 160 B2 features factory break-in and weighs only 6.6 pounds (7.8 pounds with mufflers, ignition, battery, etc.). Efficient canister mufflers are available for \$150 a pair.

FOKKER D.VI

Glenn Torrance Models (GTM) produces museum-quality, 1/4-scale, WW I RC models and offers impressive kits and related accessories. Glenn offers a Fokker Dr.1 triplane, a Fokker D.VIII

30-PERCENT ULTIMATE BIPLANE ARF

Carl Goldberg Products

Although it wasn't at the WRAM Show, the 30-percent-scale Ultimate Biplane ARF from Carl Goldberg Products is just the ticket for wild aerobatic fun. This large-scale biplane has an all-wood airframe and one-piece wing assemblies. Its accurate and lightweight construction provides great slow-speed flight, yet it's strong enough for a 4.2ci engine if you want amazing performance. At less than \$850, this hot performer has a lot to offer. Its airfoil tail surfaces provide great flight characteristics and maneuverability, and the double-beveled control surfaces (used on all surfaces) provide the control movement you need for 3D. A fiberglass cowl and wheel pants, aluminum landing gear, cabane struts and formed canopy are also included.

Specifications

MODEL: 30% Ultimate Biplane ARF
WINGSPAN: 70½ in.
WING AREA: 1,692 sq. in.

LENGTH: 78 in.
WEIGHT: 20 to 22 lb.
POWER REQ'D: 62 to 75cc gas engine



The Carl Goldberg Products 30-percent Ultimate Biplane ARF is perfect for exciting aerobatic fun.

and now—almost ready for delivery—the new Fokker D.VI. Sorta like a Fokker triplane with a pair of D.VII wings, the D.VI is a unique and seldom-modeled subject. The scale fidelity in all GTM products is amazing, and the D.VI that I saw at the WRAM Show

PCM MODELS DV8R TURBINE SPORT JET



In my last column, I wrote about the new crop of easy-to-build, uncomplicated, IMAA-legal, turbine trainers. One jet that just missed being in that March 2004 roundup was the DV8R from PCM Models. A follow-up to the company's popular AV8R turbine trainer, the DV8R is now ready for immediate release.

Designed by Patrick McCurry, this sport jet's features are sure to make it a popular choice for those who want to get their turbine jet

Just released from PCM Models, the DV8R is a great big beautiful model designed for 17- to 28-pound-thrust turbine engines.

rating. Intended for the 17- to 28-pound-thrust turbine engines, the DV8R is one of the largest sport jets available. Featuring an introductory price of \$495, the DV8R's construction is a combination of wood, foam and fiberglass. PCM Models uses CAD precision laser-cut parts; the parts count has been kept to a minimum to shorten building time. Once sheeted, the foam wings, stabilizers and vertical fins provide perfectly true flying surfaces. The DV8R has a capacious hardware bay and fuel-storage area topped with a huge top hatch (nearly 3 feet long). This allows totally unrestricted access to onboard equipment. The prototype model is powered by a Jet Cat P-80 turbine and has an all-up weight of 25 pounds (dry). To find out more about the DV8R, call (561) 793-6850, email flypcm@earthlink.net, or go to flypcm.com.

Specifications

MODEL: DV8R Turbine Sport Jet
WINGSPAN: 82 in.
WING AREA: 1,460 sq. in.

LENGTH: 86 in.
WEIGHT: 24 to 27 lb.

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PLATINUM POLYMER
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| | | | |
|-----------|------|-------------------------------------|----------------|
| #2LP400 | 7.4v | 400mAh LI-POLY pk (18 gms/ 0.64oz) | \$18.95 |
| #2LP650 | 7.4v | 650mAh LI-POLY pk (28 gms/ 1 oz) | \$20.95 |
| #2LP800* | 7.4v | 800mAh LI-POLY pk (34 gms/ 1.2oz) | \$27.95 |
| #2LP900 | 7.4v | 900mAh LI-POLY pk (38 gms/ 1.35oz) | \$23.95 |
| #2LP1200 | 7.4v | 1200mAh LI-POLY pk (48 gms/ 1.7oz) | \$25.95 |
| #2LP1500* | 7.4v | 1500mAh LI-POLY pk (62 gms/ 2.2oz) | \$39.95 |
| #2LP1700 | 7.4v | 1700mAh LI-POLY pk (68 gms/ 2.4 oz) | \$31.95 |
| #2LP1900 | 7.4v | 1900mAh LI-POLY pk (76 gms/ 2.7oz) | \$34.95 |
| #2LP2200 | 7.4v | 2200mAh LI-POLY pk (88 gms/ 3.3 oz) | \$38.95 |

*800 & 1500mAh are HIGHER-AMP packs (up to 5C discharge!)

QN-012BC charger **QN-012DC charger** **VR5.4 / VR6.0**

#QN-012BC Fast-Smart Charger (AC) for LI-POLY pk. **\$19.95**
 #QN-012DC Fast-Smart 12VDC charger for LI-POLY pk. **\$19.95**
 #VR5.4 Voltage Regulator –limits output to 5.4v max **\$19.95**
 #VR6.0 Voltage Regulator –limits output to 6.0v max **\$19.95**

NEW Lithium Polymer cells – with E-Z solder tabs!

| | | | |
|---------|------|---------------------------------------|-------------------|
| #P145 | 3.7v | 145mAh LI-POLY cell (4 gms / 0.13 oz) | \$ 5.95 ea |
| #P400 | 3.7v | 400mAh LI-POLY cell (9 gms / 0.32oz) | \$ 6.95 ea |
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| #P800* | 3.7v | 800mAh LI-POLY cell (17 gms / 0.6 oz) | \$10.95 ea |
| #P900 | 3.7v | 900mAh LI-POLY cell (19 gms / 0.67oz) | \$ 9.95 ea |
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*800 & 1500mAh are HIGHER-AMP packs (up to 5C discharge!)

Motor packs, R/C packs, TX packs, & more!

New Hi-Cell electric flight Ni-MH packs!
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 AP-1000 2/3A, 1000mAh **\$3.00** **\$24.95** **\$27.95** **\$30.95** **\$33.95** **\$36.95**

MOTOR PACKS w/ SANYO Ni-Cd cells (no connector):
 Shapes (see above). Add deans ULTRA connector for \$5.00 extra
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 N-500AR(2/3A 500mAh) **\$2.50** **\$20.00** **\$24.00** **\$28.00** **\$32.00** **\$36.00**
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SANYO Transmitter Packs w/leads. Shapes shown above
 Choose SQUARE(D) or Side-by-Side (A). Add TX plug for \$3.00.
 9.6 volt 700mAh (square or SxS, w/ leads) **\$16.95 ea.**
 9.6 volt 1100mAh (square or SxS, w/ leads) **\$22.95 ea.**
 9.6 volt 1650mAh (NI-MH square or SxS, w/ leads) **\$29.95 ea.**

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THINKING BIG



Glenn Torrance Models is known for its high-quality and beautiful airplane kits! The newest is Glenn's Fokker D.VI—very impressive workmanship!

is no exception. The kit includes laser-cut wood parts, formed metal struts and fittings, an aluminum cowl and great CAD plans. The 1/4-inch-thick scalloped plywood leading edge wraps around the wing ribs to add strength, stiffness and scale outline. Priced at \$375, the D.VI kit is a great value for anyone interested in WW I scale. Glenn also offers 4- and 5-color lozenge-pattern fabric covering and several mini-kits that add internal scale details to his models. Check out his website at gtmodels.com.

1/4-SCALE SUPER CUB ARF

The WRAM Show was my first opportunity to see Dave Patrick's new 1/4-scale PA-18 Piper Super Cub, and I was very impressed. Beautifully covered in UltraCote film, the all-yellow Super Cub has scale articulating and shock-absorbing landing gear (steel springs are concealed in fiberglass boot fairings), nicely detailed, aluminum wing struts and jury struts and a painted fiberglass, fully enclosed engine cowl. Exactly 1/4 scale, the Super Cub's wingspan is 106 inches, so it easily qualifies for any IMAA event.

The scale guys will appreciate the scale offset hinges for ailerons and the tail-covering treatment. Dave has properly duplicated the troublesome fin-to-fuselage transition radius. Other features include: premium-grade fittings; plug-in wing panels



An almost-ready-to-fly Super Cub that doesn't look like an ARF is this all-yellow beauty from Dave Patrick Models! It's 1/4 scale and beautifully executed.

with hidden attachment bolts; an aluminum wing tube; scale enclosed flap horns and a scale airfoil aileron cross-section; and well-illustrated instructions that include hints and flying tips. Priced at \$599.99, this ARF also comes with Dave's new Ultra Tailwheel assembly. Look for this Super Cub online at davepatrickmodels.com.

FAST FUELER

JM Service offers the Fast Fueler—an impressive, 3-gallon fuel-delivery system that's designed especially for the giant-scale modeler. Made of tig-welded aluminum, a hand-operated pump pressurizes the storage unit



For the giant-scale lover who has everything, the Fast Fueler is a great addition to your field accessories. This ruggedly built unit is hand-pressurized, holds 3 gallons and effortlessly delivers fuel to your tank!

from 8 to 10psi. Just open the valve, and the fuel will flow effortlessly into your model's fuel tank. The unit comes with a fuel filter, two stainless-steel valves, a pressure gauge, Viton O-rings, a safety pressure-relief valve and Tygon fuel tubing. Priced at \$350, the Fast Fueler can be used with gasoline, glow fuel and jet fuel. More information is available at Fastfueler.com.

CONCLUSION

There were many other great products for giant scale (both old and new), but I simply don't have enough space to cover them all here. If you ever have a chance to attend an RC trade show, be sure to do so. You'll get an up-close and personal look at some really great models and accessories! See ya there! ✚

Bigairplanes (860) 738-4605 days; (860) 379-4033 nights and weekends; bigairplanes.com.

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AT MODEL AIRPLANE NEWS, we not only tell you what's new, but we also try it out first so we can bring you mini-reviews of the stuff we like best. We're constantly being sent the latest support equipment manufacturers have to offer. If we think a product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."



Volume Five has something for everyone with many cool models from Great Planes' ever-growing stable of aircraft. From warbirds to turbine-powered jets and classic prop-driven aircraft, this add-on has it all. Want to do some Reno-style heavy-iron racing with your buddies? Then the Sea Fury will fulfill your need for speed. You jet guys haven't been left out, either; for excitement, try the new BVM KingCat—a smoothly flying turbine-powered jet. For more excitement, pump up your pulse rate with the BTE Double Whammy—a jet powered by twin pulse jets. The kicker for this model, though, is that it has no throttle control; you must fly it until it runs out of fuel—just like the real version! A favorite of mine is the stunning Gee Bee racer; unlike its full-scale counterpart, the virtual model is a pussycat to fly. The most unusual model in this volume of add-ons is the V-22 Osprey tilt rotor. As on its big brother, you can control the tilt of the twin rotors, and this gives you the ability to maneuver in tight quarters. I had a blast flying the Osprey into and out of the ballpark.

For the chopper crowd, it's nice to see two scale birds added to the lineup: a Coast Guard Jayhawk and the MD500E. As it is with the airplanes, the attention to detail—and to the physics of helicopter flight—is incredible. One thing a flight simulator allows you to do is to try things you'd never attempt with a model. The new blimp hangar is absolutely huge, so I spent a lot of time maneuvering the MD500E around the blimps—inverted!

This latest addition to the *RealFlight* simulator is, in my opinion, the best to date. There's so much to it that you'll spend a lot of time trying new things in unusual places. From indoors to wide-open mountain flying, you'll truly enjoy the endless possibilities. I know that I did! Add-Ons Volume Five costs \$29.99 and is compatible only with *RealFlight* G2 and G2 Lite software. —Rick Bell

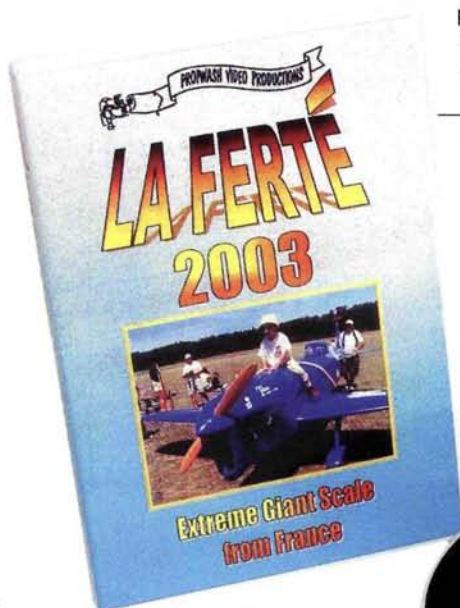
Great Planes Model Distributors Co. (217) 398-6300; (800) 682-8948; greatplanes.com.

GREAT PLANES

RealFlight Add-Ons, Volume Five

Expand your virtual hangar

Great Planes *RealFlight* G2 is a great flight-simulator program, and it continues to lead the field in virtual flight simulation with its latest addition: *Add-Ons Volume Five*. If you already own *RealFlight* and wish to expand your hangar, this is the addition to get. It includes 11 new airplanes, two helicopters and three new flying fields, and the realism is greater than ever. A refinement that *Volume Five* benefits from is that each shape is created with more polygons—the computer drafting tool used to "sculpt" graphic features and textures. The intricate details are rendered faithfully and accurately and include incredible rivets, panel lines and even gauges in the cockpit.



PROPWASH VIDEO PRODUCTIONS

La Ferté 2003 video **Giants of giant scale**

If you're into large-scale planes, you will want this video. Each year, France plays host to this annual IMAA get-together. The event features some of the largest models in the world, and I do mean *large*! This 110-minute video features 28 one-of-a-kind giant-size models that range from 40 to 450 pounds each. Included are flights of an 80-percent-scale Caudron Adelante Racer; a 1/2-scale Me 109; a 39-foot-wingspan Zlin 526 and ASK 27 sailplanes; a 350-pound TWA Super Constellation and a 450-pound B-29.

Also shown are numerous interviews with builders/pilots before their flights and a quick visual tour of the airfield. This event has it all—even a bombing run with many giant-scale warbirds flying through ground-based pyrotechnics. The French really know how to fake a war! Many of the flights include aerial footage shot by onboard cameras. Priced at \$24.95 for VHS or DVD format, this is a great addition to any video library. If you want to see some of the largest RC models in the world, this is the video for you. —John Reid

Propwash Video Productions (702) 731-5217; propwashvideo.com.



ICARE

Plettenberg Freestyle Motors

High-quality, direct-drive power

The German firm Plettenberg, long known for producing very high-quality electric motors, has introduced a unique line for park flyers and other small planes. These Freestyle units are intended for direct drive and large props. Like conventional motors, they have an inner rotor, but they have 14 poles instead of the usual two to six. The short, large-diameter design and the quantity of poles are especially well suited to efficiently turning a large prop direct drive, and the result is almost silent, seemingly effortless flight. The smallest members of the Freestyle family are 1 7/16 inches in diameter and 1 3/8 inches from the backplate to the base of the prop driver. These motors, which weigh about 2.6 ounces, come in 20- and 24-turn winds and are intended for park flyers and other small models up to, say, a 20- to 24-ounce flying weight. A larger version, the Freestyle L, is the same diameter but a bit longer, and the XL is both longer and larger in diameter. I got a chance to try out the 24-turn Freestyle, which costs \$149.99.

One thing is immediately apparent when looking at the Freestyle 24: this is a high-quality piece of equipment that is thoughtfully designed and extremely well made. One clever touch is the included prop adapter. Instead of forcing you to find, purchase and install a separate prop adapter, Plettenberg has simply threaded the end of the motor shaft for a prop-retaining nut and included a setscrew-retained flange to mount the prop against—simple, light and no extra charge. That shaft, by the way, is 5mm in diameter and is made of titanium. If you crash hard enough to bend it, you'll have much more to worry about than a bent motor shaft!

The Freestyle can be mounted behind a bulkhead like most motors (it has the standard 25mm mounting-screw spacing), or you can use an optional mounting ring to attach it to a firewall from behind. The ring is mounted with three fasteners; then the motor, in turn, is mounted to the ring with four small machine screws that are supplied with the mount. You do need room for its 1 7/16-inch diameter, which might be a challenge for some smaller models.

So, how does it perform? Well, the quality extends to extremely smooth and quiet running. I've flown the Freestyle 24 on a modified Mountain Models Switchback Sport with retracts, and it performs noticeably better than the geared miniAC 12 15/16 I have been using in this plane. With the Freestyle 24 fed by 8 KAN 950 NiMHs and turning an APC 9x6SF prop, the Switchback goes straight up and keeps going—silently. I love direct drive! By the way, performance looks really good on a 10x7SF and a 2-cell Thunderpower 2100mAh Li-poly pack, as well.

If you're looking for a high-quality, direct-drive motor for your 14- to 24-ounce sport plane, the Plettenberg Freestyle deserves serious consideration.

—Bernard Cawley Jr.

icare (450) 449-9094; icare-rc.com.



BOB SMITH INDUSTRIES

Insta-Flex, Insta-Flex+ and IC-Gel

Flexibility that sticks

You know the name; you know the quality. Now, Bob Smith Industries has three new products on the shelves in hobby stores across the nation. IC-Gel is a cyanoacrylate (CA) paste that's available in a 20-gram tube. This thick gel has the same bonding strength and curing time as another Bob Smith Industries' product, Maxi-Cure. The big difference is that IC-Gel will not run and can be applied to vertical surfaces. Use IC-Gel to fill gaps in parts or as putty on plastic pieces. Just apply it and then spray with Insta-Set; you'll be ready to sand or file in seconds. Cost: \$6.99.

Insta-Flex and Insta-Flex+ are similar to Bob Smith Industries' IC-2000—a staple glue in many flight boxes across the country. Unlike IC-2000, these Insta-Flex CAs dry clear. Both glues have superior shock resistance, and they won't become brittle with age. The thin Insta-Flex has good penetrating qualities and works great on CA hinges. These glues smell less noxious than regular CA, but they aren't foam-safe like odorless CA. Insta-Flex and Insta-Flex+ are available in 1-ounce bottles for \$5.99. —John Reid

Bob Smith Industries (805) 466-1717; bsiadhesives.com. †

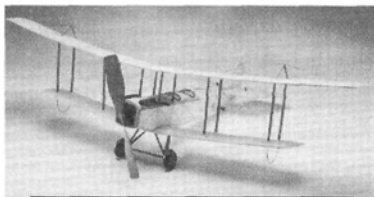


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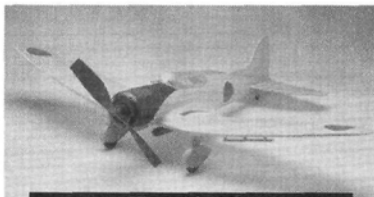
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FINAL APPROACH



MICRO AIRSHOW DOGFIGHTERS

One summer a while back, my friend Bill Watson and I were looking for a joint project, and we thought it would be cool to have a pair of semi-aerobatic WW I biplanes with working machine-gun lights and sounds so we'd be able to put on entertaining dogfights at the upcoming AMA show.

We wanted our biplanes to be more like toy airplanes than precision scale models, and lights and sounds would make them fun. For simplicity, we made the two models essentially identical. Bill built the airframes by scaling up Walt Mooney's classic peanut-scale S.E.5 plans to around a 15-inch wingspan. But the German plane presented a problem: no German plane looks like an S.E.5. We decided to go with a Pfalz and to "massage" the wing and tail outlines so it would bear some resemblance to the Pfalz. I think it kind of turned out to be a "False Pfalz" in the end, but it's a beautiful model anyway.

We built the models out of balsa and covered them with RA Microlite iron-on covering. The Microlite is like MonoKote but lighter than doped Japanese tissue. The covering makes the bright, blood-red Pfalz

look good, and the S.E.5 looks handsome in its scale brown and tan scheme.

To pull off good machine-gun sounds, I spent days tinkering with speakers, foam coffee cups, springs and old tin

drive a cam to lift and release the spring hammer rapidly. The drum membrane had to be thin and stiff to make a nice sharp "pop," so I used fish paper (a stiff, heavy paper used in electronics). Tiny, superbright LEDs hooked up to the flight computer flash alternately at a rate that roughly matches the drum sounds.

Crowds really love our dogfighters; a big cheer goes up each time we fire the machine guns during a demo. The planes can take off, do loops, wingovers and incredibly tight turns. Flying them together is a blast because they are so well-matched in performance.

At the end, we figured we had each spent around 100 hours on the models. Bill mainly did the framing and covering, and I handled the RC equipment, machine-gun drums and other miscellaneous details such as custom-machined props and wheels. Building these models was a labor of love that brought back my memories of building planes in an aeromodeling class at school (Bill and I both

learned from the same teacher—but around 10 years apart!). Although the planes are really satisfying to fly, I don't think I'll do this type of project again anytime soon; it's too much work! ✚



robot toys. I finally determined that the best system would have a spring-loaded hammer that smacks down on a stiff drum membrane that's enclosed in a box. I geared a tiny 4mm pager motor to